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Extracts from DR. VOYSEY'S Private Journal, when attached to the Trigonometrical Survey in Southern and Central India, No. III.

Saturday, 20th February, 1819.—I passed through the village of Mengoor near which, on the banks of a small nullah, the thermometer sank to 47° just before sunrise : in its neighbourhood, I also saw a bed of lithomarge lying on the alluvium which rested as usual on the trap. The fields on my right and left were full of gram and corn crops ; nevertheless I observed that a large quantity of land had been thrown out of cultivation. The approach to the Godavery was over waving land consisting entirely of trap and alluvium ; now and then beds of amygdaloid with green earth and wacké were seen, and within a mile of the river small blocks of granite rising through the alluvium, so rounded, that I found it impossible to bring away specimens. My visit to the rocks was first paid ; I found them to consist of granite forming the banks and bed of the river, the former were about 40 feet high ; of this height the granite occupied one-half and the remainder consisted of black cotton soil ; the river was shallow indeed. I crossed its deepest part, and found it vary from 2 to 4 feet in depth, its bed consisting of granitic sand mixed with a few calcedonies and agates, and on the borders magnetic iron sand ; I did not see shells. In the crevices of the rocks I found some pieces of stilbite or radiated zeolite. The height to which the river rose two years ago, was pointed out to me, it might be about 30 feet above its present level : it had washed away the corner of a wall surrounding a handsome pagoda built of black basalt :

it must now no doubt have changed its bed materially, since tradition places the pagoda many years ago, far from its banks. The temperature of the river at 12 o'clock was 74° , the same with the air. The basalt of which the pagoda is built is in some parts of the building finely polished. It contains olivine. The granite much resembles that found near Bachapilly at the Bear's rock. It is porphyritic containing large crystals of red felspar in a crystalline cement composed of quartz, compact felspar and mica. This is the prevalent rock. A porphyritic greenstone lies near it, apparently in beds, in which the crystalline felspar is compact and of a green colour arising from green hornblende? I believe them to be the same with those of the Bear's rock at Bachapilly. The distance from Thevalingapate hill is 12 miles and the sole rock is the trap, sometimes basaltic, sometimes wacké on the elevations, and in the plains black cotton soil.

Monday, 22nd February, 1819.—On quitting this place the thermometer stood at 47° and the temperature of water at $5\frac{1}{2}$ o'clock A. M. was 43° ; a march of 7 miles brought us to Monegal: nothing but trap of which I am heartily tired.

Tuesday, 23rd February, 1819.—The formations in this part of India differ materially from those of Europe; no chalk, no intermediate rocks between the trap and granite. The whole field of view, probably an extent of 20 miles. The ravines of the formation are much deeper than usual.

Sunday, 27th February, 1819.—Large beds of wacké began now to appear, generally lower, or at the bottom of the more elevated trap hills. On arriving near, a temple with a basaltic column similar to one I had seen on the banks of the Godavery struck me, and I made an attempt to draw it.

Monday, 28th February, 1819.—The river bed differed very little from that of the Mulinar. I followed it until I came to the same or a similar appearance, which had before struck me: large masses of red granite imbedded in a coarse cement of limestone, containing crystals of felspar quartz, &c. I drew a sketch of the banks which bore a great resemblance to those of the Mulinar and Manjera. We arrived at Buhtalipoor. In the evening I visited the formation of wacké, to ascertain a fact mentioned in Thomson's Annals, confirmed. It was not calcedony in wacké.

Tuesday, 1st March, 1819.—The configuration of the hills was

very striking, with the same form I have before noticed, fewer peaks, and lying at right angles to each other in many instances. Once or twice I observed a complete quadrangle all but one side, the opening being towards the plain.

Wednesday, 2nd March, 1819.—A rugged road from the frequent ascent and descent of the trap hills. On one of them I observed a vein of quartzose rock passing into flint running E. and W. I crossed the Scinde; the bed consisting entirely of black trap or basalt, very compact. At Dapky I lowered the temperature of Fahrenheit from 92° to 62° at sunset. I noticed a bed of lithomarge on my road.

Thursday, 3rd March, 1819.—The hill on which the flag is fixed about four miles and a half from Oudeghir, is covered with calcedony amorphous, cellular with impressed crystals, and striped mammillary onyx, some imbedded in the cavities of the basalt; amongst them I found one piece of green amorphous calcedony. Five hundred yards from the tent, I saw on the side of a hill, exposed by a slip, imperfect columns of basalt resembling precisely the description in Thomson's Annals; the Rowley Rag basalt. Oudeghir (the fort) stands on one of the flat hills so frequently mentioned surrounded on every side by the semi-columnar basalt.

Friday, 4th March, 1819.—I rode through the town of Oudeghir, which is entirely built of basalt. It is the largest native town I have seen, some of the streets wide and the houses neat. My sketch of the hills to the northward of the fort, when seated on a neighbouring hill on a level with it, is the best I could take; it ill represents the singular rise one above the other of the basalt: the hills representing to the eye an appearance of distinct strata, which reminds me of the Isle of France; beds of carbonate of lime are very frequent. I noticed on my way semi-columnar basalt in a large deposit to the left of the town.

Saturday, 5th March, 1819.—In the evening I rode to the right of the town and came to something very much resembling the iron clay, not very dissimilar to that of the Cape of G. Hope.

Sunday, 6th March, 1819.—In the evening I rode to the basalt; I found one column, of 8 sides, more than a metre in diameter, the interstices were filled with green earth and sometimes with the globular wacké. In some of the columns I noticed depressions and elevations for the reception of a corresponding piece as in the Giant's Causeway and Staffa.

To the westward and southward all the hills have the same appearance, and I have no doubt that they are the same formation.

Monday, 7th March, 1819.—I wandered over some hills to the left of Oudeghir, where I found trap tuff, wacké and carbonate of lime (tuffaceous) in abundance, containing crystals of zeolite apparently of fresh formation. At the bottom semi-columnar basalt very black and of great specific gravity; on the right of the town, there are very extensive ruins of houses and other buildings. The stream which struggles through the valley is fed by the infiltration from the hills. We passed on our road to Doongong, over many pavements of basalt, some of them semi-columnar with the interstices filled up by a secondary formation or injection of basalt; we saw also two remarkable elevations nearly north and south. In the neighbourhood of Doongong, vast quantities of wacké and basalt and trap tuff, alternating frequently and without order.

Wednesday, 9th March, 1819.—The land is waving as usual with a few abrupt acclivities from two to three hundred feet in height. The trap appears less subject to decomposition, having a very thin coat of soil, and in many parts, it was found impossible to drive in the tent pegs.

Thursday, 17th March, 1819.—I found on the road the basaltic trap as usual, and in the neighbourhood of a ruined building some of the iron clay in lumps, apparently brought from some distance.

Saturday, 19th March, 1819.—Reached Dammergidda at sunrise and proceeded to the Manjera, which I crossed and encamped at Chillelah in sight of Beder, distant about 5 coss seated on a hill. The left bank is of the black alluvium, about fifteen or twenty feet high, sometimes much less: the right bank rises to upwards of 60 feet in height, forming a hill of considerable size on which Chillelah is seated; the bank is composed of large masses of an earthy and crystalline brown limestone very much waterworn and containing large cavities which appear to have been formerly filled by pieces of wacké, in some places containing large masses of flint, and in others forming a compound rock being a cement to a rocky compound of wacké basalt, clay and flint. Near the upper part it has the appearance of regular stratification, and on its top wacké easily decomposable is spread over it. I have yet to observe it more closely. The carbonate of lime contains a small portion of alluvium.

Sunday, 20th March, 1819.—I bathed twice and collected on the bank of the river a large quantity of the iron sand, which I suppose to contain iron ore, very little of it being taken up by the magnet. I also found very fine clay. I took a ride in the evening and a sketch of the hills near Beder.

Monday, 21st March, 1819.—I took a more accurate survey of the banks of the Manjera in the neighbourhood of Chillerjee. The confusion or mixture of the two rocks is much greater than I at first imagined. I noticed close to the present level of the river, a rock of compact basalt which at the distance of three or four feet becomes wacké, passing into the admixture of carbonate of lime and lumps of wacké, and that again into the porous limestone containing clay, and green earth, presenting externally large cavities out of which those substances have been washed; above the limestone is a brownish wacké on which the town is built; the height of the whole is about 40 or 50 feet: the banks below and above were composed of the black alluvium, but I was told the limestone was found in considerable quantity both above and below. The height of the river was rather distinctly marked during the rainy season, by the impression it had made on the foundations of a mosque built on its bank.

Tuesday, 22nd March, 1819.—A short distance from the hill on which Beder stands, the soil gradually changes from black to a reddish tinge from the decomposition of the iron clay of the range of which and on which Beder is built. This is the greatest elevation of the iron clay that I have seen in India, the barometer indicating 2000 feet above the level of the sea. In some places particularly in those excavations near the fort, it resembles very much the iron clay of Nellore containing in its vesicles Lithomarge, and the wells are generally very deep, one measured 40 cubits; the temperature of the water was 78°. The iron clay contains lithomarge as usual and it approaches a plumb blue colour. I ascended the tower on which the flag was, and could not avoid noticing the flatness of the isolated mountains which had before struck me in so many instances.

Wednesday, 23rd March, 1819.—I noticed greenstone, granite, and basalt in different parts of the building, which was chiefly composed of the iron clay and bricks.

Friday, 25th March, 1819.—I rode this morning down the hill into

the plain to the northward, the iron clay presented in no instance an appearance of stratification, but I noticed in several instances a gradual transition from it into wacké and thence into basalt, of which there are numerous little elevations in the neighbourhood. I noticed also lithomarge in considerable quantities, both in beds and in the rock itself, I re-ascended to the southward, finding the iron clay vary in form and in some instances degenerating into an ochery soft clay. It must be observed that the iron clay itself is very soft when first quarried and becomes indurated on exposure to the air. To the south-east a curious sight presented itself in the form and disposition of the hills, of which I made a sketch taken in a different direction; the flattened summits were here most distinctly seen with the bevelments of the usual angle; around these were several small conical summits entirely isolated, some on the contrary were of a flattened rounded form, intermixed, consisting evidently of basalt.

Saturday, 26th March, 1819.—I recommenced my observations on the hill of Beder, and this morning rode to the north-westward. I every where saw the basalt at the foot of the hill passing into wacké and iron clay, in one place the transition did not occupy more than three feet and was very distinct. This easily explains the depth of the wells in the fort and the tower; the very porous iron clay being unable to hold the water it drips through until it meets with the basalt. It is proper here to observe that in most instances the vesicles or pores of the rock, had the appearance of long hollow tubes always vertical. The basalt was not confined to the valley but was found in a considerable number of elevations, of all forms, around. I observed on the western side several springs just above the level of the basalt. The singular improvidence and want of foresight in the builders of the fort was very evident in several places: finding the rock so very soft and easily worked they excavated, or rather cut it down even with the wall, it has subsequently mouldered and the wall has been precipitated with it. The high land projecting into the valley or plain through which the Manjera runs, like a number of buttresses resembling very much that at Sudghir, is seen to the westward; to the verge of the horizon to the eastward the hills have a more abrupt and irregular character. The magnetic needle did not appear to be affected by the iron clay rocks. I visited a manufactory of Beder bot-

toms ; the basis pewter, the design whether of flowers or other pattern is chiselled out of the black ground, by an instrument fitted for the purpose, a paper is pressed strongly over it which takes the sharp edges of the design, and this paper is placed on a thin sheet of *silver** for the purpose of cutting it into the requisite forms ; these are then inlaid and the edges of the pewter pressed down, so as to enclose the silver completely.

Sunday, 27th March, 1819.—Temperature of two springs on the N. W. side of Beder 76°, of neighbouring water 73°. I again examined the passage of the basalt into the iron clay. In some places the passage from the almost columnar basalt into nodular, and then into the iron clay is very distinct, on the other hand in other places the basalt appears to pass under it and in some instances forms a causeway in the path, at the side of which rises the iron clay.

Monday, 28th March, 1819.—I ascended the minaret and had a fine view of the country, the whole to the southward, eastward and westward had the appearance of a vast elevated plain ; to the north it terminates in the projecting buttresses of iron clay into the valley through which the Mayna runs and which is ten miles in breadth.

Tuesday, 29th March, 1819.—From Beder we began immediately to descend to that ground which appeared from the minaret to be an extensive plain ; consisting of numerous elevations and depressions, or a collection of several plains intersected by deep ravines. The whole consisted of iron clay, but on our road to Shelapilly four zones of the black cotton soil intersected our path running due north and south ; the difference was strongly marked. The iron clay soil was almost incapable of cultivation, and the other presenting its usual appearance of fertility. We are at present encamped on one of these zones, having a direction nearly north and south : at the foot of a conical elevation of 40 feet, composed entirely of earth from the top, the iron clay is seen on each side at the distance of $\frac{1}{4}$ of a furlong. Query, is this hill the focus whence this muddy eruption has issued ? One more is visible in the plain about 2 miles distance. The earth at the depth of two or three feet is sufficiently moist to allow it to be made into a ball with the hands. Temperature 5° below the atmosphere.

* Copper and silver nearly equal parts.

Wednesday, 30th March, 1819.—I visited the small hill I have before mentioned, and found reason to suppose it artificial. The black soil was in some places intermixed with the trap clay, and in others was in indistinct zones, all with N. or N. by W. direction.

Thursday, 31st March, 1819.—We descended from the iron clay during the night, and in the morning found ourselves on the black soil in a level plain. I found considerable quantities of carbonate of lime intermixed with the wacké which is here found in the same nodular masses with a hard kernel which I have before noticed at Banktapoo. The soil contained a large quantity of carbonate of lime effervescing considerably with acids.

Friday, 1st April, 1819.—I crossed three nullas on my road to Sedashewpett, during a journey in the dark, all running eastward along a ridge of gently undulating and slightly elevated land, as seen to the eastward as day broke, apparently a continuation of the Tandmanoo range, and taking the same direction. At day break I fell in with large masses of granite lying in the black soil, and in a ravine saw plainly that it formed the substratum covered with the cotton soil, although not in all parts, the soil being granite in the highest part. To the westward are seen the flat tops of the trap hills and the peculiar abrupt termination of the iron clay of Beder. The soil in which we are, is nearly all granitic. The intolerable heat of the day has prevented my excursions for some time past. The valley in which we are is hotter than at Hydrabad.

Monday, 12th April, 1819.—I traced the trap veins into the granite and farther east than I could follow it; it is precisely similar to that of Golconda, Suldapooram, &c. I nowhere observed it in contact and passing into the granite. It extends as far as the eye can reach in an easterly direction, sometimes forming considerable elevations, and at others, sinking beneath the surface, is scarcely visible.

Thursday, 22nd April, 1819.—Twenty-six grains of the green carbonate of lime were dissolved in nitric acid; result to be hereafter mentioned. About three miles to the N. W. of the cantonment I observed a long deposit of quartz rock. The whole of the above green line was dissolved except $3\frac{1}{2}$ grains of green earth which remained behind on the filter.

Thursday, 29th April, 1819.—Specific gravity of calcedonic agate from the Godavery. 260.

6th May.—Specific gravity of Tandmanoor basalt, 2. 816.

11th May.—Specific gravity of flint from Medcondah, 2. 63.

13th May.—Epidote from Multapoor.

Sp. Gr., 3. 312.

13th May.—Green hornblende from the Carnatic.

Sp. Gr., 3. 243.

30th May, 1819.—Here commences my expedition with Everest during the rainy season.

4th June, 1819.—To the left of the road before reaching Hyderabad I observed a deposition or bed of quartz rock which I ascended, but was not able to discern its termination on either side, its direction was due north and south. The granite in the bed of the river Mussy was reddish inclining to grey. The evening closed too soon on me to allow of any observations before reaching the camp.

5th June, 1819.—I arose with the sun and ascended the hill which rises about 100 feet above our encampment. I observed a vein of the greenstone precisely resembling that of Golconda and Secunderabad, its direction E. and W. as usual. The granite is of a greyish colour, containing large crystallized masses of felspar of a similar colour to that observed at Ardinghy.

I no longer observe loggan stones, the granite is more compact and less liable to decomposition. About a mile from the station in a westerly direction, I observed a long vein or deposition of quartz rock running north and south, probably a continuation of that observed yesterday, also on the ground numerous small concretions of carbonate of lime.

6th June, 1819.—I quitted the camp early for Chitterghat. The granite was generally of the reddish grey colour, with loggan stones, but fewer than I have observed in other parts.

7th June, 1819.—We arrived at Ballapooram, distant 8 miles from our last station, the vein of greenstone was observed to our right running nearly east and west. At one period, it crossed our path and we lost sight of it; soon after at this place we had heavy rain during four hours.

8th June, 1819.—We passed through Hyattnuggur and saw a trap vein to the right of our road which accompanied us for a considerable distance: it re-appeared at Seringhur, on the side of a granite hill.

9th June, 1819.—The granite between Seringhur and Mulkapoor

we found to be at times very red and close grained. The trap vein was frequently in our path, but very much decomposed and by an inexperienced eye would not have been distinguished from the granite. At Mulkapoor it assumed its usual character.

This place is situated at the northern extremity of a valley about five miles in length by $1\frac{1}{2}$ in breadth, the hills rise on each side to the height of nearly 600 feet, they are of granite, which for the most part is of a grey colour, containing large crystals of bluish grey felspar. The large trap vein crosses this valley which is nearly north and south, and disappears on the eastern side amongst the rocks. It is here of large dimensions and appears to contain large pieces of epidote, as I found large pieces of that mineral at its foot.

10th June, 1819.—I was one hour going to the top of the hill where a flag was fixed. I found the granite much whiter than that below, which contains hornblende and compact felspar.

The view was very much bounded by the mist, I observed a few loggan stones and the same irregular appearance of the rocks as in the neighbourhood of Hyderabad. The barometer stood at 10 o'clock at $29^{\circ} 4'$, thermometer 84° ; below the hill at $70^{\circ} 8'$, thermometer 80° . In the evening I visited the trap vein, I found a considerable quantity of epidote, also a few pieces of amethyst quartz, the vein rises due E. and W. I was afraid to trace it on account of the tigers.

17th June, 1819.—I saw several veins of the trap running in a different direction from that usual to them, they appeared however to be continuations of that large one which I observed at Mulkapoor.

18th June, 1819.—On the road I observed several trap veins and deposits on the mountains, but was not able to inspect them more closely on account of the jungle. At this place two veins were observed, the one due E. and W. coming from a considerable distance, and a small one, on which was a pagoda, nearly at right angles to it, of small extent.

19th June, 1819.—I reached Secunderabad this morning, a remarkable vein at the Mussey, probably a continuation of that of Golconda.

Wednesday, 23d June, 1819.—The hill of Bowenghir consists of a mass of granite of about 4 miles in circumference and 800 feet* in

* By trigonometrical measurement 646 in height.

height. From the plain it presents a singular appearance, the whole surface being completely bare and rounded at the top, with large masses hanging at its sides, the remains of some concentric lamellæ, part of which have fallen or slipped into the plain. On it are numerous excavations, which serve as reservoirs for water, some of very considerable depth. The colour of the granite is a whitish grey and it contains mica in separate spots. At the top is a building of a square form, formerly a palace of one of the Golconda sovereigns, the "Kootub Shahs," whose dynasty commenced in 1512 and ended in 1574. Some of the blocks of granite of which it is built are twenty feet in length. Beams of teak thirty feet in length. I observed in different parts on the surface of the granite projections of a harder and less decomposable rock which may in many cases be the cause of the loggan stones which are found here, although few in number.

Monday, 12th July, 1819.—The country passed through, Oonperty, Motamughoor, Koelcondah, Mundrick, differs in no respect in its general and particular appearances from that previously visited. The veins of greenstone are more frequent, more irregular in their direction and less continuous at Koelcondah and its neighbourhood. I observed several on the sides of the loftier hills and others at the top of the lower; in most places it was of the common kind; at Koelcondah it is fine large grained, ringing when struck and containing rather more felspar than is usual. Between Koelcondah and Mundrah, the most remarkable features were the concentric structure of the granite, the lamellæ in some instance are ten feet in thickness, their dislocation seems to have been hastened by some earthquake. The granite was reddish grey, becoming black on the weather side. On the banks of the Mussey, I noticed a trap vein apparently much intermixed and confused with the granite. At this place Mundrah, two hills in the neighbourhood, present the tabular form, there is much granite of the syenitic kind and closely resembling that of Mulkapoor. Also considerable quantities of the trap and considerable debris of quartz from veins in the granite. I have observed in many places a curious breccia of limestone, felspar, and quartz; it in some instances, resembles that on the bank and bed of the Seendy containing large blocks of granite; I have not observed it in any quantity as yet; the soil however in many places is impregnated with carbonate of lime.

Close to the base of the hill on which the instrument is fixed, a rock is broken in half by some convulsion and discovers two rounded masses of a very micaceous granite, differing remarkably from that in which it is contained, with very distinct edges, and intersected by two or three veins of granite similar to that of the containing rock. In one place the separation or slight adhesion of the two surfaces has allowed the rounded pieces of micaceous granite to fall out, leaving a hollow, such as is seen in a sandstone breccia, or pudding-stone, where the decomposition of the cement has bared the surface of the contained pebble, or angular mass, and allowed it eventually to fall out. I have long suspected that I should at least be able to prove to a certain extent that these masses which I have observed at Seeparty, at Nelgondah, Secunderabad and in other parts of this district are of anterior date. I have called it a crystalline micaceous green-stone, it is however, so small grained that I cannot now discern in it any hornblende, I shall therefore, consider it a very micaceous granite of a dark grey colour. My reasons for considering this granite to be of anterior date to that which encloses it are the following.

1. Its defined margin which distinguishes it from those veins of quartz and felspar in granite, which generally pass from one substance to the other by insensible degrees.
2. Its very different composition, the one being principally mica and quartz of a small grain rendering it very black and tough, the other an aggregate of quartz and felspar of a fresh colour and in rhomboidal crystals with a very small quantity of mica.
3. Its rounded appearance, as if it had been previously subjected to the action of some mechanical cause rounding its angles.
4. The veins of granite of the same nature with that of the containing rock and running from it through the mass.

In the immediate neighbourhood of this singular rock is a vein of the common greenstone, or rather an irregular mass without any traceable direction, since it disappears at a short distance, apparently concealed by the debris of the granite. The granite has the aspect of having suffered violent disturbance, immense masses being strewed on all sides of the rock abovementioned.

Near to the hill station is a very remarkable hill of about 500 feet in height, its tops consisting of tabular grauite; its southern aspect

presents a regular but rather precipitous slope; whilst its southern one is irregular and almost perpendicular to the upper half.

Wednesday, 14th July, 1819.—I ascended the singular hill mentioned on the other side. The difficulty was very great, and I do not think I should have been able to have descended without the assistance of my bearer. Every haunt of banditti that I have ever read of, falls short of the comparison with this singular place. One man well supplied with provisions might easily defend himself against as many as could be sent against him. The passes are so numerous and the rock is so perpendicular, that it would be impossible to watch the one or scale the other. In one place a stone ready placed to close the orifice, would completely bar all farther progress. My guide informed me that it was formerly a haunt of very powerful banditti, and we saw on our arrival at the top, bricks, mortar, and in a crevice of the rock an inclosure forming a spacious apartment. The rock is entirely granite, of the same constituents as those of the rock beneath, containing rather less mica and with veins of quartz and felspar; on the pinnacle I observed in numerous shallow places containing rain water, tadpoles and other reptiles, for whose existence in such a place I am at a loss to account.

Sunday, 18th July, 1819.—I observed on the road numerous flattened masses of granite containing micaceous granite similar to that at Mundrick; sometimes very much intermixed with it, giving it a veiny appearance, at others rounded, presenting the same appearance as that before noticed; none rose far above the surface, the whole closely resembled that of Bachapilly containing small portions of carbonate of lime, the hornblende being a little darker in colour, large and small veins of the trap as usual and nearly in the usual direction.

Monday, 19th July, 1819.—We crossed the Mussey this day. I found in its bed shells resembling those found in the silicious stone of Medcondah. The river was not three feet deep, and its bed was composed solely of granite sand.

Tuesday, 20th July, 1819.—I this morning ascended the hill of Udirgutt with Everest. The granite blocks of which it is composed resemble principally the Bachapilly kind, containing pieces of hornblende, which are seen in four or five places of a mass about 3 feet in diameter. I found crystals of quartz in abundance in an alluvial soil washed down

from the hill. At its foot were vast quantities of granite, bared, mixed in all possible ways with the greenstone, exactly like Bachapilly.

30th July, 1819.—The whole of the granite in this neighbourhood is alike ; the bottom consisting of the greenstone and micaceous granite intermixed with the granite in veins, blocks, &c., the resemblance of which to a stream of lava is very great and the course being always from the upper to the lower level. On this is placed the concentric lamellar granite containing small and large masses of crystallized hornblende. On this are masses with their interstices vertical, decomposing gradually and forming loggan stones, of which many are actually formed ; some on the concentric granite ready to fall as soon as the decomposition of the lower surface has changed their centre of gravity.

6th August, 1819.—Just before our arrival at Singharam, we passed through a very considerable deposit of the trap the extent of which I was unable to trace from the thickness of the jungle. We passed over it for about a furlong ; I observed in the river both trap and granite in large blocks.

7th August, 1819.—We passed through a very thick jungle formed principally by thorny mimosas, attended by the granite as usual ; when arrived at about half our distance, without any perceptible transition, a slaty rock appeared in our path, and from the elephant's back I observed a flat platform nearly parallel with our path of about a mile in length. I walked to it and found it to consist of brownish red clay-slate, of a kind which would be useful in roofing houses. Its termination was at a nullah, in the bed of which I observed granite of a porphyritic texture passing into a rock resembling large grained sandstone, which became clay slate of the kind before mentioned. There existed no separation or line of distinction between these three rocks, and I had a fair opportunity of observing them from the lower side of the nullah of the opposite high bank in which the passage was distinctly visible. At this nullah it ceased and the usual rock granite continued to appear at intervals. About four miles from the Kishiar at the place called Pieddere, the horizontal limestone before mentioned (see page 198) made its appearance ; it differed in no respect from that formerly described : it is, except its colour, a little darker than that on the banks of the river at Warripilly. Everywhere was seen detached pieces of the pudding-stone enclosing rounded and smooth

lumps of sandstone. In the few instances in which this was attached to the rock, they were found in the interstices or in those parts exposed to the action of the sun and the rain. In all places vast quantities of the debris were found in the shape of sandstone and quartz, and particularly near the banks of the river. The slope of the ground to the banks was very distinct when we were several miles distant from it. On its banks the limestone was abruptly broken off and the general appearance suggested the idea that some convulsion arising either from a subsidence of the strata or from an earthquake had formed the bed of the river. The banks were covered with alluvial soil and presented considerable quantities of the alluvial iron sand. A bráhmín told me that the extent of the limestone both above and below the river, was about 15 miles in each direction. Its extent in the other direction is about 40 miles.

Motapilly, 9th August, 1819.—I yesterday had some of the quick lime brought to me : it appeared to be good. A considerable quantity of calc spar is found in veins, and loose masses on the banks of the river and would form excellent lime. I rode to a pagoda about a mile from the camp and crossed a nullah beyond it, but observed nothing which induced me to continue my journey. In the evening I went on foot to the northward of the camp and found very large collections of the rounded sandstone, intermixed with jasper, crystallized quartz and containing in it carbonate of lime and calcedony with a white decomposed surface. In one or two places I observed the cement still adhering to the rounded lumps forming the pudding-stone. On all sides were numerous deep fissures in the limestone rock, through which the torrents flowed, smoothing the rough edges of the limestone. I should have before mentioned that the strata appeared generally to dip a little to the E. N. E., this dip however, is in some places scarcely perceptible.

Piedderree, 11th August, 1819.—On the road I observed bits of the clay slate, but the rock itself no where visible. I observed a vein of trap running about three miles in a N. E. and S. W. direction, considerably elevated above the granite ; which contained many pieces of the micaceous granite before described, in the flat masses near the village.

13th August, 1819.—I observed nothing but the limestone. It appeared to have undergone some convulsion, the strata lying at various

angles of inclination and generally at about 25° . The greater part of my road lay through alluvial soil, the limestone appearing only at intervals; near the river nothing else was visible. I observed in many places that the calcareous cement or pudding-stone laid in the horizontal interstices of the limestone, and in no instance did I find it covering any extent of surface.

14th August, 1819.—The limestone as usual for about three miles, when it appeared to pass into clay slate, and at last became covered by a quartzose rock, which without any appearance of stratification formed a range of 150 feet in height, branching off in different directions; its general one being nearly the same with that on the other side of the river (E. and W.) and probably of the same composition (Pooly-chentah). To arrive at Moogtial I was forced to make a considerable detour, the road lying through land which had been covered a few days before by the overflow of the Kistna. Moogtial is a small town in the English territory with a fort occupied by the Zemindar. I pitched my tent close to the river and near a quarry of the limestone, in which I observed many large blocks some twenty feet in length, lying close to the water edge as if ready for water carriage; the blocks were cut out of the solid rock to the requisite thickness, and wedges inserted in the interstices of the stratification and the block was complete.

Anantagherry, 15th August, 1819.—I observed the calcareous compound again in the interstices of the limestone and am forced to conclude that it is of contemporaneous formation. This rock is still visible for three miles, when the ground appeared covered with pisiform iron ore and alluvium. At the village of Boodoor and on the banks and bed of the Paleer, a clay slate formed of layers of *blue, grey and red*, horizontal, and covered by the quartzose rock before described; this was soon succeeded by the granite and its usual accompaniments trap veins. One remarkably large and distinct one appeared continuous with that of Lingageree before mentioned.

Anantagherry, 16th August, 1819.—I this morning breakfasted with Everest who gave me specimens of clay slate from Polychinlah; of brown iron stone from Saraugapilly; and of a mixture of chlorite slate with limestone and quartz from between the two stations. The upper part of the Polychinlah ridge, is of quartz rock crystallized in rhomboidal pieces and rapidly decomposing.

Anantagherry, 17th August, 1819.—On the south side of the hill of Anantagherry, a very thin vein or dyke of basalt is seen running in an east or west direction through the concentric granite. At the bottom of the hill it is first seen about a foot broad and continues about 100 feet upwards, gradually decreasing in breadth until only a line in thickness, when it disappears. It runs in a zigzag manner and does not project above the surface. In it are enclosed small pieces of granite, which is of the same nature as that of the hill. The granite contains compact felspar of a green hue, and the basalt glittering crystals of basaltic hornblende. This basalt is easily fusible before the blow-pipe.

Hydershabeeptt, 20th August, 1819.—In the bed and on the banks of a river running near this place, the mixture of the granite and trap is very remarkable. In some places it is enclosed in it in the same mode as the micaceous granite of Solokoondah, in others running in thin veins, and lastly mixed in streaks, as if it had been melted with it and flowed down.

Hydershabeeptt, 23rd August, 1819.—On the top of the hill I saw in many places the rounded masses of micaceous granite enclosed in the rock, which itself contained large scales of mica and garnets and was in beds, generally very large grained and decomposing very fast; the top is above 500 feet above the plain.

Hydershabeeptt, Saturday, 23th August, 1819.—The bed of the river which flows near this village, presents a very remarkable mixture of the granite and trap in veins, and in rounded masses. The former appear to be of later formation, since a vein passes through one of these rounded lumps. The same vein is also heaved out of its course several inches by some convulsion. I was able easily to fuse a small piece of it before the blow-pipe. It more nearly resembles the basalt vein of Anantagherry, than the common greenstone vein which is also not so easily fusible.

Monday, 30th August, 1819.—I observed on the summit that same mixture of the granite as before mentioned. At this village I observed a small rock with concentric layers and the mixed granite.

Sunday, 12th September, 1819.—The hill of Babecondah is a mass of concentric granite about 500 feet above the plain and occupies the centre of a range of broken hills of the same nature, running about 5° to the west of north and extending three or four miles. The principal

rock is granite of a grey colour with a considerable quantity of quartz and very little mica. It encloses masses of micaceous granite as usual, some of which are bent into various forms, differing probably from the original, and when they were in a semifluid state. I saw also on different parts of the summit and sides red granite with large crystals of felspar, also enclosing the lumps of micaceous granite. The hills to the eastward of this station present one continued waving outline of forty or fifty miles in extent, gradually diminishing in height to the N. where they become flat and present openings in their course, not very dissimilar from those in the environs of Beder. At their highest part they present two or three small peaks, but their general outline is waving without the ruggedness of the granite.

Yesterday I went to see a quarry of calc tuff about three miles to the N. W. of Ingourtee. It differs very little from that so commonly spread in this country.

Wednesday, 15th September, 1819.—We passed through a defile in a range of mountains running nearly North and South composed of granite, with quartz rock strongly impregnated with iron lying over it. On the descent from the opposite side I observed clay slate, but not in distinct strata, until I had advanced about one mile and near to a river, when it appeared at intervals running horizontally or with a slight inclination.

In the bed of the neighbouring river, I observed bits of granite, limestone, clay slate, quartz rock and agate; its banks being about 15 feet in height and alluvial soil.

Thursday, 16th September, 1819.—Our camp was this day pitched in the neighbourhood of a nullah which was at the foot of a range of small hills, and on the banks I perceived clay slate in large masses without regular stratification and lying on alluvial soil. The bed of the nullah consisted of quartzos esand. We passed through on our way to Commerarun, winding through the vallies formed by the broken ranges of mountains, a fine alluvial tract, the substratum being only visible at intervals, which at all times and without any perceptible difference of level was clay slate, sandstone and quartz rock. Near to Commerarun in passing through a defile composed of an alluvial red clay, I observed on the surface, numerous agglutinations of ironstone very much resembling the iron clay, the ground being at the same

time strewed with black magnetic ironstone similar to that of the red hills near Madras, and broken pieces of quartz rock. The village of Commerarun is finely situated in a circular plain bounded on all sides by waving hills of clay slate, rising from 200 to 600 or 800 feet above this.

Friday, 17th September, 1819.—I ascended an elevation, at the foot of which our camp was pitched; I found it to consist of indurated clay slate in vertical strata. Its natural fracture from decomposition was in an oblong thin lamellar piece, with sharp edges; some which I observed at the top was rather porous.

Saturday, 19th September, 1819.—I started at 4 o'clock, and halted at a village called Mocarra. From Commerarun the rock was principally clay slate, with quartz rock lying on its surface in broken pieces; the vallies between the hills were very narrow, and the sides of the hills precipitous, with fine cascades of water rushing over the disrupted strata, which generally dipped to the S. E. at various angles. One mountain near my halting place had a tabular form with something like sandstone or quartz rock on the top. In the beds of the nullahs near this I generally observed angular and rounded masses of this rock.

Anchitipilly, Sunday, 20th September, 1819.—A short time after day-light, having started at 3 o'clock, I observed sandstone in very large masses, little elevated above the surface. The greater part of the road lay through alluvial soil covered with forest trees and a thick jungle. At 2 o'clock I arrived at Paloounchali which has a large square fort built of sandstone with bastions at each angle. The Godavery is 15 miles distant, due East.

The country from the clay slate to the Godavery, is sandstone cemented by alumine. It appears in some places to be in a state of rapid decomposition. The range at Paloounchali 1,000 yards from the fort is 600 feet in height? Mr. Burr says 1,200, which I doubt; 5 miles in length and a mile in breadth is composed of the sandstone and it runs due E. and W. Hot spring of Bougah: Mr. Burr says, it is sulphureous; hills in the neighbourhood very lofty, the Mooee Enoo river of Paloounchali runs into the Godavery.

The temple of Buddrachellum a remarkable object; Boorgamallapadu, in its neighbourhood, is said to contain diamonds,—a hill called the needle hill of Pachapilly, are remarkable peaks on the other side of

the Godavery and part of the Vindhiya range which runs N. W. and S. E.

Monday, 24th September, 1819.—The holes so frequently interrupting my night march appeared to communicate with gullies under the surface of the alluvial soil and running on the sandstone beneath.

Tuesday, 25th September, 1819.—The tabular mountain of which I have spoken on the 19th is near the place where the clay slate first makes its appearance in coming from the eastward, in stratified masses little elevated above the surface, a S. E. dip and an angle of about 40°. The change in the soil was very perceptible, the traces of travellers dried by the sun showing adhesiveness and clayey composition. The hill above alluded to had its upper half, at least, composed of sandstone. The access was too difficult and my time too short; at a distance the precipitous hills and rocky narrow vallies commence.

The clay slate is generally very much indurated, contains large and small veins of quartz; I observed also quartz rock or sandstone about its centre. The explanation that first presented itself of the phenomena which were here seen on so grand a scale was, that all the clay slate had been originally covered with sandstone, and that a general and partial subsidence of strata had taken place, producing on the one hand the dip to the S. E. and on the other the central isolated masses with precipitous sides and covered by the sandstone which had remained in its original state.

Tuesday, 28th September, 1819.—I ascended the hill of Punchbundoll twice during my stay at Commerarun. The road to it lay through a plain of six miles intersected by nullahs, containing most generally angular pieces of sandstone and clay slate and very little alluvial mud. The ascent to the hills was about 4 miles in length and lay over quartz rock or sandstone and slate. In the ravines quartz or sandstone alone was to be seen lying in the strata, but horizontal. The principal ravine I passed had apparently been formed by a slip of the strata, one side being perpendicular and the other a gentle slope.

Komarum, 30th September, 1819.—During this day's journey I nowhere observed the iron clay; the greater part of the road lay over alluvial clay. At times indurated sandstone or quartz and clay slate of the kind described at Allatoor, small pieces very much decomposed and passing into clay.

Bondoll, 1st October, 1819.—The road lay as usual over alluvial soil and clay slate. In the beds of the nullahs both the latter and sandstone were observed during the last six miles. We passed over a hill consisting solely of sandstone which we saw in very large blocks and rapidly decomposing.

I examined the sand of a nullah and found it to consist solely of quartz grains, although the stream was very turbid, which I suppose to arise from the aluminous cement of the sandstone.

Yellapooram, 2nd October, 1819.—We began to cross the N. and S. range of mountains consisting of quartz rock or sandstone and clay slate. The first ghaut we passed consisted of large masses of sandstone decomposing very rapidly. This was intermixed with red and brown ochreous ironstone. At the distance of four miles after passing a small nullah, on our left appeared an abrupt lofty elevation of sandstone; the masses presented on their surface and sides indurated veins of a substance composed of grains of quartz and brown ironstone of much greater hardness than the sandstone and therefore projecting from less facility of decomposition. Not far distant from this and in a position which warranted the idea that they had fallen from the precipice lay large masses of puddingstone, composed of white and brown pebbles of quartz with a sandstone matrix. I saw from beneath that the upper part of the rock was composed of this, whilst that underneath it appeared to have few or none in it. This continued for a mile or more, when the iron clay was observed in large distinct masses and mixed with the sandstone, both in veins, lying as it were in the interstices of different blocks, and mixed with it, forming a conglomerate rock. This occupied a very small space and was succeeded by the sandstone, the beds of all the rivers were composed of quartz sand.

Warungull, 12th October, 1819.—I observed a considerable number of pieces of jasper lying loose and that the neighbouring elevations were of sandstone. It was dark when I began to ascend the hill; but having ascended it every day we remained at Yellapooram, my observations are all given together in this place. The sandstone is rarely seen in the plain, being covered with an alluvium, the paths and beds of rivers are all sandy. On commencing the ascent the sandstone presents itself in large unstratified masses, with its surface coloured from decomposition, being nearly black exteriorly and interiorly of a

yellowish grey. I observed in various parts, the indurated feruginous waving veins or partitions before observed, p. 289. Also loose pieces of jasper iron ore, and quartz with a large proportion of iron. The top of the hill was composed of sandstone in which pieces of lithomarge were prevalent, and the rock itself appeared to be cemented by that mineral.

Mr. Ralph told me that the rocks all the way from Palounchah to Mungpett were of sandstone, and that greenstone was found in the bed of the river. He gave me a piece of brown iron ore, jaspery iron ore, and an agate found on the road. He was travelling towards Sinsillah, a place noted for its iron mines and manufacture of steel: of which Conah Rao showed me a specimen in a very handsome dagger.

November 7th, 1819.—The whole of yesterday's journey was through trap and granite. The former of the usual appearance; the latter very indistinctly seen above the surface until we arrived at the bed of a bamboo river,* where it was seen in considerable blocks. Here I was told that plates of mica were procured. I accordingly observed that some of the granite was very micaceous and very white; we arrived at dusk near the river.

December 19th, 1819.—Left Secunderabad on the 18th. On crossing the Mussy I observed nearly the same appearances which I have before noticed on a former journey: I arrived at Ombrepett in the evening. This day I observed abundance of the red granite, and the vein of trap which I have before mentioned entirely disappeared. In the evening I rode to our former place of encampment with Ralph; I observed large masses of granite lying on the surface of the main rock the result of the decomposition of the last rains.

December 20th, 1819.—I gathered on my way to this place, Gorampullee, some red granite with hornblende, and some specimens with limestone intermixed with it; I began also to see the calc tuff at Uddajuth. The descent this day was considerable, although the distance travelled was not more than 12 miles.

December 21st, 1819.—In crossing this day our old station of Uddajuth and the Thieves' hill, granite as usual and veins of trap.

December 22nd, 1819.—Great quantity of granite with pieces of the micaceous granite enclosed, also pieces of the greenstone in veins and lumps. Nakurkull.

* So in MSS.

December 23rd, 1819.—Granite as usual, and camp at Sooriapet, beyond the Mussy, the bed of which is here very broad; I observed no rocks.

Mungal, 24th December, 1819. Granite as usual.

Shermahommedpet, 25th December, 1819.—I gathered some granite on the road to this place, here I first saw the black soil.

Nundigaon, 26th December, 1819.—On my road from the last village to Nundigaon, I ascended a hill, at the foot of which the road ran. It was composed of granite, which here and there contained lumps of the micaceous granite. Its upper third was composed of granular quartz rock, or it may be called a highly crystallized sandstone. I also observed near Nundigaon a vein of basalt passing through the granite, which was of the usual kind, but contained more hornblende than usual.

Chinchirlak, 27th December, 1819.—A coss distant from Purteal, we quitted Chinchirlak at day-light to go to the diamond mines at Purteal, which lies nearly south of the former, about a coss. We passed through the black soil covered with fine crops of jouwarrie; about three miles to our left was a range of mountains which bounded the plain to the eastward running due north and south. On the other side were the indistinct ranges of Polychinta on the banks of the Kistnah and before us those of Condapilly. On our approach to Purteal we began to perceive many rolled pieces of quartz, greenstone, jasper, sandstone and granite; evidently not the debris of the neighbouring mountains. The mining process had been sometime abandoned, and the workmen were employed at the site of the old excavations in resifting the old rubbish; the produce of their labour scarcely repaid them with the means of subsistence. The old excavations were very numerous, and about 20 yards square, and filled all over with water and rolled stones, I found a breccia limestone containing quartz, garnets and jasper. They were of an irregular form and did not appear to have been subjected to the action of running water; I enquired if diamonds were ever found in them, and was answered in the negative. The process of searching for diamonds performed before me was as follows. The large stones were first thrown on one side and the remainder of the heap carried into a raised platform of mud where from a sieve, the large ones were dropt on the ground by means of a lateral motion of the hand and the dust remaining deposited in another mass which was spread abroad, wetted

and gone carefully over by another person. In the course of his search he laid by the agates, cornelians, jaspers, sapphires, garnets, &c. which are said to abound. I purchased the whole stock of diamonds of the village, amounting to 3 oz., for 4 rupees, and some cat's-eye, garnet, sapphire, jasper and calcedony for 2 rupees. The village was in ruins and the people did not appear so well fed or clothed as those of the village we came from. On returning to the tents I visited a rock nearly in the centre of the plain, consisting of three peaks, which suggested the idea of the pinnacle of some deep-seated granite mountain. The granite was very red and containing hornblende in crystals. After breakfast, I went due east from the camp, three miles, to visit the range of rocks I have before mentioned. I found them to consist of granite, composed of felspar, hornblende, quartz and some mica, which however was not always to be distinguished. Two things are well worthy of consideration respecting the situation of the diamond mines: they are surrounded on all sides by the alluvial black soil, which has originated in the inundations of the Kistnah. They are not elevated above this soil, and I should imagine were once covered by it, although they at present appear elevated from the quantity of earth thrown out from the different excavations, of which I counted at least twelve.

2. The neighbouring rock is of that kind to which it is difficult to assign a name, although its constituents are very distinctly marked, namely, felspar and hornblende, yet from the equal mixture of those two minerals I should prefer the name of syenitic greenstone. It is worthy of remark that the mountains six miles distant are of vertical gneiss.

Ibrahimpett, December 29th, 1819.—We arrived at this place crossing the end of a range of irregular hills which appeared to run nearly due N. and South. I conceive that Dr. McCulloch would call the rock syenitic greenstone; or perhaps would call it merely a modification of the granite of which the whole of the basis of the country is formed. Unlike, however to the out line of the hills of granite to the N. E. North and N. W. they exhibited no loggan-stones and no bare summits but were covered to their tops. After breakfast we went to Condapilly and there saw Mr. Spry who inhabits the old fort, at the foot of the range which in Heyue's Map commences at that place running due N.

E. and which he has named gneiss. Ibrahimpett is on the left bank of the Kistnah, which is about twenty feet in height, composed of the black soil; the bed is however very sandy and very broad, perhaps two miles.

Bezvara, December 30th, 1819.—Our road lay in the bank of the Kistnah, which river suddenly contracts to run through the pass of Bezvara formed by two hills of gneiss that appear to have been separated by force; according to Dr. Heyne the range is continued to the N. E. I ascended and found his description correct, except that I did not observe the ochre which he spoke of as mixed with the other ingredients composing the rock. In some places the stratification was not all distinct but appeared massive like common granite. Veins of felspar traversed the rock, and in many places I observed black spots on the rock, arising as I suppose from oxydation of the Iron.

December 31st 1819.—I crossed the river early to visit the caves near the village of Ungley. They consist of three excavations one over the other; the roof is supported by pillars of the usual form in Hindoo temples. Around the walls were different relievos very much mouldered. The upper story contained a colossal figure of 25 feet in length, lying on stones in a recumbent posture; around him on the wall in relief, figures of deities; and two colossal figures which appeared to protect his slumbers. The whole was excavated out of the gneiss rock, which is very fast decomposing, the decomposition taking place principally in the centre of the pillars. The lower excavation leads, it is said, to Mungulghery about three coss distant. In returning down the causeway cut in the face of the rock I observed what appeared to be limestone mixed with the granite, also something bearing the appearance of manganese. The rock consisted of quartz, felspar, mica and jasper in great abundance; the stratification in the Bezvara hill was very evident from this side, the dip of the strata was to the eastward and the angle about 70 or 80°. The range suddenly takes a turn to the N. E. to the northward of Bezvara forming a portion of segment of a circle. I a second time ascended and reached the summit of this hill. The prospect was commanding and embraced a field of 30 miles each way; perhaps much more, as I was told, Onnda was visible on a clear day, distant 40 miles. The range of Chintapilly or Pooly Mintan was very distinct as well as the Guntoor districts near Ardingby. It may be remarked here that the

decomposition of the gneiss although rapid does not supply a rich soil. The figures in the pyramid appeared to have had their damage sustained from this cause repaired with plaster, which was fresh enough to lead one to the supposition of its being modern.

January 1st, 1820.—I went to Mungleherry at eleven o'clock; two miles of our road lay over the black soil, and was succeeded by that arising from the decomposed gneiss in the passes through which our road lay. The difference of level was very perceptible, the latter being the highest ground, and if the alluvial black soil has been deposited as I suppose by the floods of the Kistnah, the phenomenon admits of an easy solution. Mungleherry stands at the southern termination of the remarkable range of gneiss rocks, which is continued with several interruptions to the bed of the Kistnah and re-appears on the opposite bank at Bezvara, the passage of the Kistnah between the precipitous sides of each mountain forming the celebrated pass of that name.

The tower in front of the pagoda of Mungleherry is about 100 feet in height, it is composed of 12 stories of the usual form. It is built of a red sandstone containing large and small grains of quartz. The variation of the compass, supposing the pyramid to be N. and South, is about half a point. The stone had been recently brought from a considerable distance according to the Brahmin. The sculpture and relievos were much inferior to the specimens of those from Amrawutty.

Masulptaur, January 4th, 1820.—Yesterday morning at 11, I arrived, after passing for the greater part of the journey over black cotton soil, which was succeeded by sand about 3 coss from Masulipatam. Immediately also commenced the groves of *Borassus flabelliformis*, and *Euphorbia Tirucalli*, both of which grew very sparingly on the former soil. I was particularly struck on arriving at the sandy soil with the mirage or appearance of water, with trees, and houses reflected on it. On passing through the Bazar I observed many stones resembling those of Amrawutty, and which, as I was informed by Mr. White, had been brought from thence.

The sand in some parts was covered with the magnetic iron ore, mentioned by Dr. Heyne in his tract on the Circars.

February 5th, 1820.—Analysis of limestone from the Kistnah :

Carbonate of lime	84
Silica Alumine Iron	16

February 9th, 1820.—Left Guntoor at five o'clock for Bellumcondah at dusk, and at the distance of three coss N. W. of Guntoor, I crossed a low range of syenitic greenstone; the specimen I have preserved presents on one surface a very considerable quantity of hornblende in crystals mixed with a small quantity of felspar, and on the surface some spots much resembling mica. I have now so frequently met with a mineral resembling equally hornblende and mica that I am constrained to think with Mr. Brande that they mutually pass into each other. The range from which I procured my specimen had partly the concentric structure, which distinguishes the granite to the N. and partly a concrete structure; that being generally at the uppermost part of the rock. At day light on the—

10th February, 1820.—I arrived at Bellumcondah and prepared immediately to ascend the hill. I took the height of my barometer within 30 feet of the top. The remains of the fort and of the building are of Hindoo architecture; some of Moghul. The rock is principally composed of a granite containing quartz, felspar and small spots of the substance intermediate between mica and hornblende. In general outline it resembles much those rocks to the northward, such as Coil-kondah, &c. having nearly the same direction, and like them veins and distinct masses of greenstone running through it. I observed at the summit of the hill a very large piece of greenstone, which seemed to have survived the decomposition of the rock in which it was once enclosed, from its greater toughness. The appearances however of the granite were not always the same; sometimes the felspar became red, and the whole contained a greater quantity of mica; quartz impregnated with chlorite was sometimes found in veins and detached masses.

Upon the whole I have no doubt that the granite is of contemporaneous formation with that to the N.

At $\frac{1}{2}$ past 2 o'clock I left Bellumcondah travelling at the foot of the granite range for about 4 miles. The plain I then entered frequently presented isolated masses of granite, decomposing rapidly, and giving rise to a red siliceous soil which did not appear very productive. On my left to the N. W. I saw the range of Chintapilly characterized by its being crowned with quartz rock or crystalline sandstone. The lower formation seemed continuous with the granite of Bellumcondah.

Amrawutty, February 11th, 1820.—I arrived at this place at sunrise and immediately mounted my horse and visited Depuldinny. I found a circular excavation about 300 feet in diameter, its angles facing the intermediates to the cardinal points ; all the stones dug up had been removed to a bungalow hard by, belonging to the Rájáh. I noticed two capitals of columns partly visible, the earth not having been cleared away from them, I bathed in the river, jumping from a mass of granite rock which projected into the Kistnah ; there were many quartz veins running through it, it resembling very strongly No. 7. On my return I made a detailed examination of the stones in the bungalow, No. 25. I then re-visited Depuldinny. I had leisure to notice that the area occupied by the stones, was circular and 100 yards in diameter. It is probable that the extent is somewhat greater, since I observed some of the circular capitals bisecting the circle in a direction E. and W. The area contains a well dug by the Zemindar Jugganauth Row, about 15 yards square, the depth about twenty feet, the upper half the calcareous breccia or pisolite, the lower micaceous schists in vertical strata injected with veins of the calc breccia, both vertical and horizontal, communicating with each other. I afterwards paid a visit to the pagoda : nothing remarkable but the inhospitality of the Brahmins. I crossed the bed of the Kistnah to Autcom, the bed is three miles wide and contains a very large island, on which I observed the thistle ; a few esculent grains growing on the black mud of which the upper part is formed. The old man Apparoo, whom I had previously seen at Purteal made his appearance. He told me that the greatest depth of the diamond mines was 18 or 20 feet, and they then came to an earth called Nushar, which was soft, and that the real reason that fresh ground was not opened was from the want of capital to begin ; the price of labour was a seer and a quarter of jooarrie each man per diem. No diamonds had been found in any of the villages for a considerable period. At five o'clock I went to the diamond mines with the Kurnum, sending my bearers on towards Condapilly. I saw nothing but heaps of old stones and earth by the side of the excavations. The calc tuff and the pebbles of jasper and quartz were the most conspicuous in the excavations ; but I was told that there was a considerable quantity of fresh ground to the north. I arrived at Condapilly at nine o'clock.

Condapilly, February 12th, 1820.—I ascended the hill of Condapilly at sunrise but was unable to proceed farther than the palace and fort

from fatigue. The hill appeared to be composed of one rock, syenitic greenstone; the appearance of a crater was particularly remarkable in the centre of the hill. I descended and found that Captain Grey had arrived during my absence. I quitted it in the evening for Mylaram and arrived at Ankerpilly on the 13th February 1820.

After remaining a greater part of the day I ascended the hill, the east side of which is occupied by 4 pagodas in succession. I found the rock to be granitic, but twisted to a great variety of forms, sometimes resembling the mica slate at Aberdeen, sometimes that of lava. I was much surprized at the obscene figures on the car of Juggernaut carved in wood. I left in the evening and arrived at Malavilly at night.

At sunrise on the 14th February, went to the mines which are in obliquely elevated land about a mile from the village. I was attended by one of the miners who had formerly worked there. The excavations were deeper and longer than those of Purteal. The depth to the diamond bed consisted of three layers of earth occupying a space of about twenty feet. The rocks in the neighbourhood appeared to be of granite, or at least resembling it. I had not seen any thing of the black soil from my leaving Mylavarum. There is a considerable quantity of ground which has not been examined, the whole ground occupies a space of a coss surrounding the whole village. I was informed that the cause of the working of the mines having ceased was want of capital, and the disinclination of the landholders to their extension.

There is a formation there common to all the diamond mines that I have seen, namely, the calcareous tuffa; the more I see of this the more I am convinced of its affinity to the iron clay formation, and that it will be found passing into it. A short time after leaving Ankerpilly the palm trees made their appearance indicating our approach to a siliceous soil. Two or three coss from Ellore I entered on a spacious plain resembling the dry swamps of Masulipatam and its neighbourhood. The soil was for the most part red, containing silex and alumine, but in the immediate neighbourhood of Ellore the cultivation had impregnated it with more vegetable and animal matter. At Ellore I met a surveyor of Colonel Mackenzie's (Mr. Donegan) who showed us some of his maps. I observed that throughout the Guntoor district the level gradually descends from the banks of the Kistnah, this I ascertained from the bund of the tank being most generally toward the sea. The

scale of this map was one mile to an inch. He also observed that the sandy soil and its stripes of palm and cultivation, extended about 6 miles inland all along the coast, and he expressed his opinion that it owed its origin to the winds that blew it from the sea shore, and not from the desertion of the sea.

I left Ellore on the 19th February, at six in the morning for Rama Singhwaram $13\frac{1}{2}$ miles: for the first two or three miles open country and thin cultivation on the soil common to the neighbourhood of Ellore. It was succeeded by red soil and pisiform iron ore, similar to that covering the iron clay, at times large pieces of a conglomerate resembling the iron clay of Midnapore, and red iron ore.

February 20th, 1820.—After travelling from four in the morning I arrived at this village nine miles distant. On my arrival at sunrise I ascended the hill, my barometer not being with me I could not take it up. I found the rock to be sandstone, the cement lithomarge, which was also found in it in large and small amorphous masses, together with jaspery and red iron ore; rounded pebbles of quartz were intermixed, and it strongly resembled the rock of Yellapooram and the country around, containing in it those linear shells* of a black ferruginous substance and presenting in no instance appearances of stratification. One part of the rock which I visited and which had been hollowed out artificially was studded with bits of lithomarge white and pink, and had the projections which I mentioned as having been observed on my march to Jellapoorun last year, the dome was an excavation in the rock forming a small chapel with a cupola from which ribs descended to the girdle; the lingam was of a solid piece of rock but decomposing very fast. I observed in my evening's walk two large trees growing near the tank, of the *Strychnos potatorum*.

Monday, February 21st, 1820.—I left the village of Narsapoor an hour before sunrise, our road lay between the vallies of the sandstone formation, and was rendered difficult by the loose sand into which it had decomposed. The elevations were slight and the ranges much broken, their connexions with the vallies generally by an easy slope.

The horizon around us is entirely concealed by hills, the general direction of which is N. E. and S. W. their outline rather flattened and rounded with a few conical elevations. We saw the hill forming

* So in MSS.

one side of the pass through which the Godavery flows, distant about 40 miles. The soil appears very productive but does not contain any carbonate of lime. The hills are covered to their summits with trees and jungle.

Tuesday, February 22d, 1820.—After a very fatiguing march through the jungle, in consequence of losing my way, I arrived at Ashwarroopoor. We passed the frontier a short distance before our arrival (1 coss). There I saw numerous pieces of red iron ore, rounded and amorphous, the soil and other appearances generally resembling that of the iron clay. I paid a visit to the Rajah of Paloonshah, who is the owner of the village. I saw a well about 35 feet deep; the lower 20 feet consisted of a mixture of clay and sand of a whitish and yellow colour, easily friable, and not effervescing with acids, on the one side, and on the other a loose mixture of clay and rounded pebbles of iron stone; in short the iron clay in the most imperfect and unconnected state. The white clay and sand appeared to contain in it some extraneous bodies, but their forms were too undetermined to enable me to guess at their nature.

Wednesday, February 23d, 1820.—I rose early to go to the ruins of an ancient village called Polarum, and in my way crossed a nullah which was reported to come from the hills and to run the whole year. The soil appeared generally to be highly capable but covered with jungle. The village we went to visit was a proof of the former extent of cultivation; even its ruins are covered with jungle.

Thursday, February 24th, 1820.—In the evening I went to the neighbouring hill, a low range running nearly north and south, and to my surprise found the hill composed of syenitic granite in which the felspar was smallest in proportion, and the hornblende sparingly distributed.

On the surface of several masses I observed hornblende in crystals, the thickness of the jungle prevented me from seeing to any distance round. At the bottom of the hill I observed pieces of the conglomerate sandstone in abundance but saw no rock visible.

Merripullee, Friday, February 25th, 1820.—The road was strewed with debris of the syenitic rocks. In one place I observed rounded pebbles resembling those found in the conglomerate; also pisiform iron ore. About 2 coss from the last village I crossed a small nullah in the bed of which was granite and the sand granite.

In a second nullah close to the village the banks were of alluvial clay, they contained very large masses which presented, in one or two instances only, a stratified appearance with a south-east dip, of an angle of 70 degrees. The granite contained felspar, mica in crystals, hornblende and quartz. I also found in it veins, with all those ingredients, but in much larger masses, the veins were parallel to the stratification. In a vein composed principally of whitish felspar, I found crystals of corundum and tourmaline, the latter of a pale green.

The vein was parallel to the dip of the strata; on passing farther on, below the river, the same kind of granite in large masses and without any appearance of stratification occupied the beds and banks. It sometimes contained masses of red and white crystalized felspar the latter containing small specks of mica. I saw at the distance of about 20 miles the peak of Rachapilly. The general direction of the mountains is very difficult to be made out, but that of N. E. and S. W. the nearest. The sand of the river was granitic, being composed of the debris of the granite and small garnets.

Thatkoor, Saturday, February 26th, 1820.—This place is about 13 miles N. W. of the place where Mr. Burr was taken ill last year, and where he terminated his survey of the Godavery; on our road hither from Merripullee we crossed the river twice, and found in its bed the same kind of granite and granitic sand. We saw two cultivated spots of land in the forest on our way to this place.

After dinner I went to the Godavery about a mile and a half to the eastward, the bed consisted of granitic sand mixed with calcedony carnelion, agates, jasper, and flinty slate: the banks were about 40 feet in height and composed of the black alluvium, and the bed a mile wide; on the opposite side of these were lofty hills and one particularly remarkable for its peaked summits. The village of Rachapilly is very near it.

Sunday, February 27th, 1820.—We rode in the evening to the bank of the Godavery. Having descended it I went about $\frac{1}{2}$ a mile on the sand, until we came to a bed of rocks in the river. We found them to be the slaty granite or gneiss. On our return we picked up the same stones which we observed yesterday.

Monday, February 28th, 1820.—We arrived after rather a fatiguing march at Coveeda, which is on the bank of the river. In the evening

I descended the lofty bank which cannot be less than 45 or 50 feet in height, whilst the breadth from bank to bank must have been $\frac{1}{2}$ a mile, we measured three hundred yards of dry sand, and the remainder was about 800. There were a number of people called Reddies, sitting on the opposite bank, watching our motions: I began to light watch fires very early.

Tuesday February 29th, 1820.—We arrived at Kaukusnorr leaving our large tents behind us, the road being impassable for bullocks, horses and elephants. From the steepness of the rocky bank we were obliged to make a considerable circuit amongst the hills; we crossed several times during the morning a river which we were assured was never dried up during the hottest season. In two places, I observed on its bank masses of a rock resembling the iron clay of Midnapore, which contained pieces of black iron ore resembling the slag of a blacksmith's forge. Our road lay through the hills and in a very circular route. In the afternoon we travelled along the river side to Perunapullee a small village with four small houses. Near it a rapid torrent rushed from the summit of Papeondah into the river. We returned by torch light.

This was the limit of our journey by land.

Wednesday, March 1st, 1820.—We left the village of Kaukusnorr in one of the rude canoes belonging to the cultivators, who are here called Reddies, dwelling on both sides of the water. I had first ascertained the temperature of the water at sunrise and found it 10 degrees higher than that of the atmosphere, which was 64°. The temperature rose and fell repeatedly during our short voyage to Peruntaputtee. On landing I examined the temperature of the mountain stream, 68°; that of the air being then 72°; about 9 o'clock. After breakfast we again betook ourselves to the boat and proceeded in an easterly direction as far as the village of Poloor where the river takes rather a sudden turn to the southward, and is confined by the bases of the lofty hills of the Papicondah pass which we estimated at 2000 feet above the river level, we proceeded, still confined by these lofty banks, until we found ourselves distant about a mile from a village called Sri Raca and a mile and half from Caroor both Company's villages and on the right bank of the river. At this place we found two masted boats proceeding with sails at about the rate of two miles an hour up the river for wood, empty; they belonged to Rajamundry, distant about 15 coss. Polavarum about 7 coss.

We set out on our return about 3 o'clock and soon found ourselves relieved from the intense heat of the sun's rays by the shadow of the lofty mountains. As we returned we had leisure to remark in various parts of the river small accumulations of sand and various nooks and jutting points, but no black alluvium, which renders it probable that the mass of this soil is deposited at and before the entrance of the pass which is at Coloor: we gave the name of Ráma's peak to the highest on the right bank, and that of Sitá to the highest on the left, and to the other (one-tree hill) Latchman's peak. I was well pleased at the opportunity I had of passing through this lofty ravine. I had entertained doubts previously of the propriety of calling the formation gneiss, the slaty structure being so rare and that of the concrete massive being much more common. Here I had an excellent opportunity of observing that they resembled generally the granite hills of Scotland in their peaked summits, and in their angles corresponding generally with that of the fracture of the smaller masses: the general structure of the granite was felspar of a very pearly lustre and easily dividing into rhomboidal pieces; quartz, and garnets.

On the General Vibration, or Descent and Upheaval, which seems, at a recent Geological period, to have occurred all over the Northern Hemisphere.—By GEORGE BUIST, L.L. D.

The whole of the Desert betwixt Cairo and Suez bears the clearest evidence of having, at no distant period, been under the bottom of the Sea.

After a fall of rain an efflorescence of salt still appears on its surface. The gravel consists of rolled pebbles, mostly portions of the adjoining rocks. It is every where mixed with sea shells. The Desert at the Centre Station reaches an elevation of 800 feet, and shells are said to be found at the elevation of 2000, both on the African and Arabian side.* This most probably has been elevated at a remote period in comparison with the date of the upheavals along the shores of the Red and other Seas about to be noticed.

* Dr. Wilson's *Lands of the Bible*—Dr. Hoffmeister's *Travels*.

All around Suez there is a vast expanse of level plain extending from two to twenty miles inland, diversified, here and there, with hillocks of drifted sand, obviously the effect of the wind. A section of the material of which the plain is composed is exhibited along the sea shore. It is about eight feet above high water mark, and consists entirely of sand, gravel, and shells perfectly fresh, and apparently of the same varieties as those on the beach. This upheaval extends, with little or no interruption, all the way to Aden, unless where the cliffs advance boldly on the Sea. A similar beach, at a similar elevation, is found all around the peninsula of Aden; and though I have had no means of personally determining the fact, I have no doubt it will be found all along the Arabian coast, around the Persian Gulf, and so on to Scinde, and by the shores of Goozerat and Cutch. Of the Delta of the Indus I shall have occasion to speak by and bye, and so at present pass over Kur-rachee. At Gogo, in the Gulf of Cambay, the raised beach is peculiarly conspicuous: the gravels and shells are here cemented into a variety of stone on which I have bestowed the term "Littoral Concrete," from its being always found near the shore, and from its resemblance to the artificial building material called concrete. At Gogo it overlays a huge mass of blue clay. With the interruption occasioned by the Delta of the Taptee, the raised beach, mostly consisting of the material just named, extends all along the shore to Bombay, and so on to the southward; and though I cannot speak from experience of the coast further south than 19° , I have great reason to believe it to be continuous, and feel almost certain that the specimens sent to me from Cochin, by General Cullen, belong to it. The upheaval in all these cases varies from six to nine or fifteen feet above high-water mark, rarely attaining the higher elevation. The same thing prevails around a large portion of the shores of Ceylon.

The Island of Mauritius is belted by an enormous coral reef throughout its whole shore, excepting about ten miles. Between Savanne and Bois-du-Cap the sea foams against a barrier of coral from five to fifteen feet in height, and wears it into the most fantastic shapes. At a considerable distance inland, and almost concealed by the trees and shrubs, are two remarkable points or headlands of coral, from twenty to twenty-five feet above the level of the sea. The Observatory of Port Louis is built upon a stratum of coral ten feet above high-water mark. Blocks

of coral, too vast for being transported by any existing agency, are found from 600 to 1300 feet inland, and which are cut off from the shore by elevated ridges.* The great part of the numberless Coral Islands which are scattered betwixt the Cape of Good Hope and Ceylon—the Chagos Archipelago, the Seychelles, Laccadives, and Maldives, appear to have been elevated to their present level by the same upheaval by which the terraces now under consideration have been produced, of which, I have no doubt, abundance of traces will be found all along the shores of our Eastern Seas. Captain Newbold mentions the abundance of this class of phenomena on the coasts of the Mediterranean, where the shell gravel, as in India, is being cemented into stone. Beaches hardening into stone prevail along the straits of Messina.† Damier speaks of a calcareous deposit in New Holland, consisting of rock, which he thinks must have been formed by the drifting up of sand and shells over a mass of wood, the whole being afterwards consolidated by rain water: this I have no doubt is an instance of the variety of formation, and a proof of the double movement under review;‡ and it seems not improbable that the shell formation of Madeira belongs to the same class of beds, though of this I cannot speak with confidence.§ The narrow Isthmus connecting the Rock of Gibraltar with the main land is obviously the result of an upheaval, probably of the same age.

Amongst the numberless points where evidences of an upheaval are to be found in Scotland, are the following:—The railway betwixt New Haven and Edinburgh cuts a large bed of shells about twenty-five feet above the level of the sea. A large bed of cockles, obviously in situ, is found at Borrowstoun Ness,|| in the Forth, at about——feet above high-water mark. Cockles live at from 2 to 5 feet below low water. All around the shores of Fife to St. Andrew's, there are beautifully distinct exhibitions of upheaved beaches, several appearing in succes-

* Transactions of the Geological Society—Jamieson's Journal, 1841.

† Jamieson's Journal, Vol. XLIV. Page 63.

‡ Journal of Researches, by Charles Damier.

§ Macaulay.—Jamieson's Journal, 1840. The Madeira Wood is spoken of as being silicified: if so, it must belong to a much more ancient date than the class to be described.

|| McLaren.—Jamieson's Journal for 1850.

sion.* These beaches, which have from St. Andrew's to Ferry point on Craig been covered with drift sand, re-appear along the banks of the Tay—from this westward by Newburgh and Perth. Betwixt Errol and Invergourie Bay on the opposite shore, is a bed of cockles, about three feet above high-water mark, corresponding closely in character with that of Borrowstoun Ness.†

The Arbroath Railway cuts and exposes the shell bed from near Dundee to Broughty Ferry, after which, it is concealed by the sandy Downs. It re-appears to the eastward of Arbroath, and again in Lunar Bay, and to the north and south of Montrose. Beyond this my researches along shore have not extended.

Two beaches are described by Mr. A. Stevenson, off the Ross of Mull near Skerryvore,‡ on the Frith of Clyde, and probably along much of the low part of the coast to the south.§

The reasons why raised beaches are not at all continuous along our shores, are very obvious. Where the shore was precipitous, and the water deeper at the bottom of the cliff than the whole amount of the upheaval, then, though the bottom of the sea might be raised by so much, and the water become to this extent shallower, there would be no emergence, and the aspect of the coast would then be nearly the same as before—the cliffs having become just so much loftier. Beaches, originally existing, have been swept away where the whole of the material composing them consisted of sand, shells, or gravel, or where they rested on rock liable to decomposition; and the sea in these cases has once more approached its former cliffs or margin. Along the shores of Fife there are beautiful illustrations of beaches well preserved, where the rock was well exposed in a way advantageous for resistance, and of their disappearance, where it was otherwise.

* Chambers's Old Sea Margins.—For the sake of brevity I have been compelled to speak very generally: it is the lowest and most recent of the Sea Margins with which I am dealing.

† Buist's Geological Survey of Perthshire.—Highland Society's Transactions, 1838.

‡ Jamieson's Journal, 1840.

§ Chambers's Old Sea Margins.

Near Crail the rock dips under the sea, and exposes a surface



well suited to withstand the surge, and there accordingly we have extensive raised beaches with the old sea cliffs a considerable way inland. Near St. Andrew's, again, it is the reverse of this. The rock dips away from the sea,



and the upheaved beach has been worn away, the waves now attacking and abrading the old sea cliff. In this, again, ten or twenty feet up the cliff, we have caverns—Lady Buchan's at St. Andrew's, and that of Kinketh to the south, which doubtless opened out on the former beach, and were excavated by the surges of the ancient ocean.

I have rarely met with shell or gravel beaches off the mouths of our great rivers; the deltas or mud deposits have in these cases taken the place of the original beach, or covered or concealed it—or the whole has been eaten away again up to the verge of the purely fresh water deposits by the advance of the ocean. The alluvium of the deltas of our great rivers can only be accounted for on the hypothesis of upheaval. Streams, which run sluggishly, or are partially stagnant, may give us sandbank;—silt, such as that of the Ganges, the Taptee, the Indus, the Nile, &c., is only precipitated when the water in which it is suspended, is permitted *for some time* to remain in a state of absolute repose. Even were it otherwise, the deposit of silt must be restricted to the limits of the inundation, and yet in fact the inundation rarely extends over more than a mere fraction of the true alluvial delta. The same is the case with our carse lands in Scotland—clearly consisting of river-silt, yet of silt which could only have become accumulated and consolidated under water in a state of repose. The level of our delta,

and carse corresponds very closely with that of the most recent of our upheavals, of which I have no doubt they form a part.

I now come to the proofs of a descent having occurred anterior to the upheaval. It is, I think, nearly twenty years since Dr. Fleming described the occurrence of beds of peat, with tree-roots, obviously *in situ*,* both in the estuary of the Tay and the Bay of Lago.

The fangs and fibres of the roots are still entire, and as fast in the ground as when alive: the stumps protrude some distance, through the peat bed. Dr. Fleming seems at this time to have supposed that they were confined to the bed of the river; he does not seem to have been aware that the peat bed was found everywhere under the clay of the low carse, surmounted by from twenty to thirty feet of alluvium. Peat beds of a similar nature are found covered over with a deep layer of alluvium in the valley of the carse, and at Perth. Similar deposits occur at Mount's Bay in Cornwall, in Lincolnshire, and in Orkney. In 1837, in a report drawn up for the Highland Society, on the Geology of the South Eastern portion of Perthshire, I specially adverted to the circumstance of the occurrence of the beds of cockle shells under the silt, and above the peat and tree roots, which seemed to me only capable of being explained on the hypothesis that when the trees grew in the position now occupied by their roots, the surface of the land must have been at least ten feet higher than at present, so as to have placed them above the tide:—that a subsidence of at least twenty feet must have occurred, and that during this period the cockle bed came into existence; and, as the earth continued to descend, became buried in the mud which now covers it to the depth of ten feet:—that the movement must have next changed its direction, raising the cockle bed at least ten feet above its original position, bringing the Carse of Gourie sixteen or twenty feet above the sea, and elevating the tree roots to low water mark.

The phenomena around us at Bombay exactly correspond with those of the Carse of Gourie. The whole of our littoral formations consist of the concretes already referred to, or of loose sand and shells. From three to ten feet under this (the depth varies) is a bed of blue clay,

* The books at our command in India are few in number. I am unable to lay my hands on Dr. Fleming's papers: I quote from Dr. Anderson's account of the Geology of Fife, given in Swan's Review of Fife, Vol. I. page 215.

exactly similar to that with which our estuaries are being silted up. In a great majority of cases the blue clay is filled with the roots of the mangrove—a shrub which only grows within high water mark—avoiding water of more than four or five feet deep. The fangs and fibres of the roots are perfectly entire—some of the thickest of them, indeed, are but imperfectly decayed,—most of them are converted into a substance like peat; and when dried break with a conchoidal fracture and semi-resinous lustre something between jet and lignite. These roots and this arrangement is found to prevail all around the Island of Bombay, on many parts of the Island of Salsette, on the shores of the Gulf of Cambay, and at Kurrachee in Scinde. This state of things is not peculiar to creeks, bays, or estuaries; and can in no way be accounted for by the ponding back of water—it prevails all around the shores of our islands and estuaries into the interior as far as the gravel or concrete beds themselves, and is visible on those portions of our shores exposed to the full force of the ocean. It seems very probable that the New Holland trees described by Mr. Damier, and the Madeira Wood mentioned by Dr. Macaulay, may belong to the same class as the roots I have described, though I have not felt warranted in adducing them as proofs of the hypothesis.

I am satisfied that to this variety of objects the lignite, found near Cochin in lat. 8°, belongs; and that, were our shores examined, it would be found at intervals everywhere along them. In Scotland at Perth, in the Carse of Gourie,* in the carses of Falkirk and Sterling, under the present city of Glasgow, and along the banks of the Clyde, boats and canoes have been dug out from under ten to twenty feet of alluvium, and still ten or twenty feet above the level of high water. Mr. Chambers infers from these things, and I think most conclusively, that the habitation of our island took place before the last thirty or forty feet of its elevation was gained from the ocean. May we not go further than this:—from the relations of these relics of human art to the peat beds and submerged forests around is it not probable that the depression under review was in progress within the human period?

The absence of roots in situ is no proof of a depression never having occurred: at the present moment, for every fifty yards we have mangroves, we have at least 1000 where there are none; and on abrupt,

* Chambers's *Old Sea Margins*, page 19.

sandy, or rocky shores, wherever indeed the locality is unfavorable for the collection of mud and the growth of vegetables, we can have no direct proof of depression.

If, as I have shown, we have the old sea margin of nearly uniform character, aspect, and elevation, presenting itself every where, it is not surely too great a stretch of inference to conclude that the depression was, like the upheaval, not local but general, and that they everywhere accompanied each other.

This theory of double movement completely solves all the mysteries attendant on the formation of coral reefs—the general descent permitted beds of coral of very great thickness to be formed, the ascent brought the whole again to the surface, or above it.

This paper was prepared for the Edinburgh meeting of the British Association. Just after its despatch by the Mail of the 26th July, I found that the meeting of the Association would be long over before it could arrive, and so sent a copy to the Asiatic Society of Bengal. It is necessary to state this and explain the multitude of allusions contained in it to the geology of the East Coast of Scotland—a locality but little known, in all likelihood, to the bulk of the members of the Society.

Aborigines of the North East Frontier.

To The Secretary of the Asiatic Society.

Darjiling, Sept. 16th, 1850.

SIR,—I have the honour to enclose another series of Vocabularies obtained for me, by the Rev. N. Brown of Sibságór, in furtherance of my plan of exhibiting to the Society, a sample of the lingual affinities of all the Aborigines of India, on an uniform plan. The present series comprises four dialects of the Nágá tongue,—the Chútia, the Ahóm, the Khámti, the Láos,—and the Siamese. My valuable correspondent Mr. Brown has favoured me with the following remarks, on the present occasion.

“The first four columns of the table complete the variations, priorly given, of the strangely corrupted Nágá language. This tongue affords an extraordinary exemplification of the manner in which an unwritten language may be broken up even upon a small extent of territory. On

the other hand, in the great Táí family we have a not less striking instance of the preservation of a language in almost its original integrity and purity, through many centuries, and in despite of a vast territorial diffusion; for, from Bankók to Sadiyá, along the Meinám, Salwén, Irawádi, and Kyendwen rivers, up to the sources of the Irawádi, through 14 degrees of latitude, there is but one language, notwithstanding the diversity of Governments under which the speakers of it live.

“The Míthan and Tablúng Nágás (see table) reside on the hills east and north of Sibságor. The Kháris descend upon the plains near Jór-hát. They are superior much to the other Nágás. The Jabokas and Banferas are the neighbours of the Mítháns, with nearly similar tongues. The Angámis occupy the southern end of the Nágá country. The Chútia is the language of one of the old tribes of Assam, now nearly extinct. The Ahóm also is nearly extinct as a spoken tongue. The present Ahóms of Assam, descendants of the conquerors, still form one of the largest portions of its population. But their language, as well as their religion, has been relinquished for those of the Hindus. Their ancient creed had little resemblance to Buddhism or to Bráhmaism. The Khántis retain their tongue but have lost their creed. They have accepted Buddhism from the Burmas, from whom they have likewise borrowed many new words.

“In answer to your queries I can but say, at present, that I highly appreciate the importance of a standard for the Indo-Chinese tongues. But which language has the best claim to be constituted such I do not know. I should be inclined, however, to assume the Burmese, which is at least *half brother to the Tibetan*. This would bring the Tibetan, the Lhópá or Bhútánese, the Burmese, the Singhpho, the Nágá, &c., into a kind of family union. The Siamese Shyán, or, as the people themselves call it, the Tai, cannot be brought into the same category. It has little or no affinity with the neighbouring dialects, and may represent another whole class of languages not yet ascertained. It is probably allied to the Chinese and is in importance not inferior to the Burmese.”

I am, &c.

B. H. HODGSON.

	<i>Mithan</i> <i>Nágá.</i>	<i>Tablang</i> <i>Nágá.</i>	<i>Khari</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deoria</i> <i>chulia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Laos.</i>	<i>Siamese.</i>
Air	rangbin	wang yak	aning	tikhe	beni	lóm	lóm	lóm	lóm
Ant	tiksá	tik há	hungzah	hache	chimechi	nyuchu	mót	mót, puak	mót
Arrow	sán	láhan	takaba	thiwu	átá	lem	lim	lempün	lukson
Bird	ó	óuhá	ozah	pará	duá	nuktú	nók	nók	nók
Blood	áj	ih	ai	unhi	chui	let	lüt	leut	leuat
Boat	khóá	iseng	aróng	ru	nu	ru	hü	heu	reua
Bone	rá	wau	taret	uru	pichon	tau	nuk	duk	kaduk
Buffalo	loi	tek	apang	rali	mé	khrai	khwai	khwái	khwái
Cat	miáh	ami	mochi	nunno	midige	men	miáu	meau	meau
Cow	máhu	máhu	masú	mithu	mósu	hu	ngó	ngóá	wóá, ngóá
Crow	okhá	ausapa	waru	chéjá	duká	ká	ká	ká	ká
Day	anyí	tiní	asónaga	tiso	sánjá	bán	wan	wan	wan
Dog	hí	kui	ai	tasü	shi	má	má	wan	wan
Ear	ná	ná	tenhaun	anye	yáku	pik	hú	má	má
Earth	háván	katok	alí	kije	yá	dín	dín	hú	hú
Egg	otí	kek	ansü	podzü	dujá	khrai	khai	phendin	phendin
Elephant	loák	lok niu	sati	tsu	meu	tyáng	tsang	chang	chang
Eye	mik	mik	tenik	amhi	mukuti	tá	tá	tá	tá
Father	apá	opáh	tabá	apó	tsipá	po	po	po	po
Fire	van	áh	matsü	mi	nye	fai	fai	fai	fai
Fish	ngiá	nyále	anghá	kho	tsingá	pá	pá	pá	pá
Flower	maipóá	chupeng	taben	popu	ibá	blok	mok	dok	dokmai
Foot	tchya	yah lan	tachang	uphi	yápasu	tin	tin	tin	tin
Goat	rón	yun	nabóng	tanü	lipeduru	pe	pe	pe	pe
Hair	khó	min, su	kwá	atsü thá	kin	phrum	phóm	phóm	phóm
Hand	chak	yak	takhet	abi	ótun	khá	mü	mü	mü
Heud	kháng	sang	telin	atsü	gubong	hó	hó	hó	hó
Hog	vak	ak	auk	thavo	chu	mu	mü	mü	mü
Horn	róng	wong	tih	pokhye	nu	khau	khau	khau	khau
Horse	man	kowai	kungri	chekwir	góri	má	má	má	má
House	ham	nok	aki	ki	nyá	ren	hün	heun	reuan
Iron	jián	yan	ayin	je	sung	lik	lék	lek	lek

	<i>Mithan Nágá.</i>	<i>Tablung Níngá.</i>	<i>Khari Nágá.</i>	<i>Angani Nágá.</i>	<i>Deoria. chutia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Laos.</i>	<i>Siamese.</i>
Leaf	pan chak	phum yak	tuwá	ponye	chiá	bóu	maü	bai	bai
Light	rangai	nining	snaugo	ngukwi	dákári	leng	leng	leng, tseng	sawang
Man	mí	sauniak	ami	theme	mósi	kun	kun	khón	khón
Monkey	mainuk	simai	kishá	takwi	iku	lahng	ling	wok, ling	ling
Moon	letnu	le	leta	kharr	yáh	den	lün	deun	tawan
Mother	ánuu	onu	tü	azo	tsimá	me	me	me	me
Mountain	....	....	apih	chaju	asü	doi	noi	lukhau	lukhau
Mouth	tun	chusim	tabaun	amü	duuju	sup	sóp	pák	pák
Musquito	....	....	mriá	viru	dán	phreng	yung	yung	yung
Name	man	min	achu	nzá	mu	mu	tsu	tsü	chü
Night	rang nak	vang niak	áyáh	tizi	siri	dam	khün	khün	khün
Oil	mangá	mangá	tutsti	kakizu	tu	man ngá	nam, man	nam, man	nam, man
Plantain	....	....	mangó	tekwasí	tüzu	kui	kue	kue	kue
River	shuá	yang nú	atsü	kharr	ji maji	khe	khye nam	nam me	mé nam
Road	lam	lam	ndi	chách	tságu	táng	táng	tang	tháng
Salt	hum	hum	machi	matse	sün	klu	kü	ken, kem	kleüa
Skin	khóan	soh	tagap	bikhr	chukun	plek	nam	nam	nam
Sky	....	....	aning	thi	pichoni	fá	fá	fá	fá
Snake	pu	pu	ahü	thiuhye	dubu	ngó	ngü	ngü	ngü
Star	letli	cháhá	peti	themü	jiti	dau	nau	dau	dau
Stone	lóng	yóng	alóng	kache	yatíri	frá	hin	hin	hin
Sun	rang hán	wang hí	suhí	nakhí	sánh	ban	wau	kang wan	tawan
Tiger	chianú	salmu	akhi	takhu	mesá	sú	sü	seu	süa
Tooth	vá	phá	taphá	uhu	hati	khüu	khüu	khiau	fán, khiau
Trec	pan	peh	sundóng	sí	popon	tun	tun	tón	tón
Village	ting	tying	ayim	aramé	átigu	báu	mán	ban	ban
Water	ti	riang	atsü	zti	ji	nam	nam	nam	nam
Yam	....	....	....	....	....	....	....	....	....
I	ku	tau	ní	á	án	kau	mau	uam	uam
Thou	nam	nam	nam	no	no, áni	mó	kau	hoaman	man dóm
He, she, it	mih	taupá	nam	áwe	bareni	heu	maü	khá	khá
We	....	....	akau	áwe	jarauá	rau	lau	man, tan	khon, uam

	<i>Mithan</i> <i>Nágá.</i>	<i>Tablung</i> <i>Nágá.</i>	<i>Khavi</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deoria</i> <i>chutia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Laos.</i>	<i>Siamese.</i>
Ye	....	....	nikhala	notoleli	jakugroni	kha	maü sú	....	su
They	....	....	tungkhala	tothete	bárió	khren	man khau	....	khau ar ai
Mine	kukuhe	tesei	ni	....	ányo	au	kau	....	....
Thine	....	....	nang	....	niyo	mó	maü	....	....
His	....	....	akhet	....	biyo	heu	man	....	....
One	áttá	chá	ane	po	dugshá	ling	nüng	nüng	nüng
Two	ányí	ih	asam	kane	dukuni	sang	song	song	song
Three	ázam	lem	phali	sü	dugdá	sam	sám	sám	sám
Four	álí	pilí	phangá	deh	duguchí	sí	sí	sí	sí
Five	ágá	ngá	tarók	pangu	dugumua	há	há	há	há
Six	árok	vok	tani	sóru	duguchu	ruk	hók	hók	hók
Seven	ánath	nith	sachet	thene	duguchi ?	chit	tset	tset	chit
Eight	áchet	thath	tekü	thetha	duguche	pet	pet	pet	pet
Nine	aku	thu	tarah	thaku	duguchuba	kau	kü	kau	kau
Ten	ban	pan	makhi	kürr	duguchuba	sip	sip	sip	sip
Twenty	chá	....	samrá	makü	....	sau	sau	sau	yé sip
Thirty	....	....	lirah	sürr	....	sám sip	sám sip	sám sip	sám sip
Forty	panyí	....	tanam	lhide	....	sí sip	sí sip	sí sip	sí sip
Fifty	....	....	rukra	ripangu	....	há sip	há sip	há sip	há sip
Hundred	pugá	....	(wanting)	kre	....	pak	hák	hoi	roi
Of	....	....	ná	....	....	(wanting)	(wanting)	....	thi
To	....	....	bine	....	....	....	hang, ti	....	ke
From	....	....	ashe	....	....	....	luk	....	té
With	....	....	gü	kinu	....	chum	kannü	....	duei
In	khá	sah	tamüge	....	chikimi	khau	nai	nai	nai
On	....	....	hikü	....	pichoni	nu	neu	bón	bón
Now	atha	cháha	jikü	akihawe	dereeni	tinai	tsang, ngai	leng	reu, than chai
Then	....	....	kuim	lilittha	deremai	tamnai	....	....	müa
When ?	....	....	thani	tadzune	dumoni	phreu nai	....	....	wan dai
To-day	anyí	tinyi	teje	thedu	dumoni	banai	....	wanni	wan ní
To-morrow	nai ni	ngai ni	asang	thedu	disuni	sang manai	....	phuk	phungní
Yesterday	manyi	manyi	hashi	koshe	duparoni	poi	mangá	....	wa, wán

	<i>Mithan Nágá.</i>	<i>Tablung Nágá.</i>	<i>Khari Nágá.</i>	<i>Angami Nágá.</i>	<i>Deoria chutia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Laos.</i>	<i>Siamese.</i>
Here	....	....	nikó	haki	lohore	u, tinai	phe, thai	ní	ní
There	....	....	wadengü ojú	lithe	hobóng	tet	hanpun	....	thi nau
Where ?	pau pu	tau wai	kuchi	kiraporú	boróng	bó	thaii	tinai	thi nai
Above	ding	kawang	tamachingu	bale	picho	nu	kan lu	pin	bón
Below	hopang	opang	tamóksing	chakise	kumo	lep	....	lum	tí
Between	....	....	tióng	kite	....	klang	....	....	wang
Without	....	....	takigü	kinu	bajüni	bi	....	....	thi nok
Within	....	....	tisinge	chawé	chikimi	khuju	....	....	thinai
Far	atai	kátike	uragu	chaguno	asain	jau, sai	tinaii	....	kli
Near	hole	ótike	anhagu	chakungo	butugain	klat	kaii	....	kai
Little	ohipia	echinghá	ichadango	katuno	poiaini	chut	lek, kye	....	leknoi
Much	tailu	eselai	kwalangau	kyapür	poiui	rä	nam	nak, láii	lai, bundá
How much ?	....	....	kuia	kichuru	amcha	....	....	kilam	ki lem
Thus	....	....	itangó	tsawe	lakireni	plai	nang nai	....	yang nan, chen
How ?	....	....	kotisaü	nokidihika	dakang	....	....	....	thau, phrá het
Why ?	....	....	chibatsawi	kaji	damno	wá	....	....	phrá aurai
Yes	vai	aiya	hau	e	hoi	khewo	tsaii	tsai, men	khá
No	mantai	mang cha	nongó	mowe	bóya	bukhewo	ma tsaii	bo tsai	míchi
Not	....	....	tá	....	dá	bu, ua	le, tak	bo, mai, yá	mí, yá
And	....	....	....	....	....	....	....	le	le, kap, tak
This	hi ha	thoi nan	pío	hawe	tailoui	iu	an nai	ní	ui
That	hi ha	thoi theo	poicho chu	liwe	bare	heu	an nan	nan	nan
Which ?	....	....	kubai	kiuru	boroshini	panku	an naii	....	khondai
What ?	tem	toí nan	chabaü	kaje	dandarini	re	sang	sang	arai
Who ?	ovch	owai	sui	soru	basani	phreu	phati	khai, phai	khrai, süng
Any thing	....	....	kuai	kajipuru	damasirini	phieu	....	asang	arai
Any body	....	....	kuai mürh	chakra paru	shamádu	kin	kan phong	....	kin
Eat	sá há	háchi	tsaung	chiliche	harini	kleu	kin	kin nam	deum
Drink	singhá	yang ying shi	atsóng	dzü kretowe	jimine	non	kin nam	non, lap	lap
Sleep	jipdau	chuushi	ipigli	zü	yung arini	teng	non, nap	tün	tün
Wake	....	....	sisaugó	sirte	harumani	khru	tün	häu, khóa	hoaro
Laugh	nile	nichi	manitli	nu	hatakari	....	khó	....	....

	<i>Mithan</i> <i>Nágá.</i>	<i>Tablung</i> <i>Nágá.</i>	<i>Kharí</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deoria</i> <i>chutia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Laos.</i>	<i>Siamese.</i>
Weep	saple	saptike	chipli	krá	ugavini	hai	hai	hai	rong hai
Be silent	....	....	tukurá	chasibale	turucha	supmu	yú tsip tsip	dak dak yú	ning yú
Speak	káh	táh	ahushang	pusiche	icharini	bok	wá	pak	phut
Come	ráhai	ongkoi	himerang	akiphirche	ákená	má	má	pai, men	má
Go	tóng	angsi	wá	totache	tákarni	ká	ká	pai, yun	pai
Stand up	ajóng	yong chi	hunligili	thale	dudurini	ti	sau	song	yang
Sit down	ngó dau	um chi	manio	baché	kerurini	ngang	ngang	nang	nang
Walk	tóng, káh	angsi	róng chwa	tothe	jononini	ká	pai	men	dün
Run	rikhe	phal chi	senekwa	mhathele	larini	paikhan	len pai	wing pi	wing pi
Give	láhái	yakhu	khugó	süwawe	borini	heu	hai	hai	hai
Take	paule	yakei	hirangó	khrlilwe	lario	au	au	au, nap	au, nap
Strike	maithun	set chi	yakchau	vashuwe	borini	dá, po	po	tí, bup	tí, boe
Kill	langdau	toi chi	yaksitógó	dukbiawe	botechiro	potai	au tai	khá, au tai	khá, au tai
Bring	láhái	yakei	henerathi	seyawe	larini	ánmá	au má	aumá	au má
Take away	pai pau	noh si	henerangó	satele	laromni	sung	sóng, thú	sóng, thú	thú
Lift up	laukó	noh si	chungótsó	tupele	lagaromni	yok, tang	yó, yóng	yá	yók
Hear	athak	chai ba	jaugó	silowe	kanatori	nyin	nyin	dai yin	dai yin
Understand	avan	tau singpu	metechau	siwe	takarini	hú	rú, hú	rú	rú
Tell	....	....	....	....	....	bok	wá	bok wá	bok wá
Good	maile	mailunke	aró	viwe	churini	dí	ní	dí	dí
Bad	maumai	yemei	maró	sowe	chani	khya	hái, bodí	hái, bodí	chua, mai dí
Cold	ráng kham	wang sam	aiyang	sí	chepepe	khye, náu	yen	náu, yen	yen, náu
Hot	kham	shem	tetsá	khakwu	kaiñi	ran, lut	hon, mai, lüt	hon	ron
Raw, (green)	....	....	tachim	memo	pijo	lip	nip	dip	dip
Ripe	jum	yim	tenhing	me	munom	rung, suk	suk	suk	suk
Sweet	ti	urang	miang	che	jiri	oi	wán	wán	wán
Sour	shí	sí	tehsan	khye	sitotoi	sum	sóm	sóm	sóm, preo
Bitter	khá	khá	khá	chásí	kai	khum	khóm	khóm	khóm
Handsome	....	....	* kubaitaró	visu	ichubare	khyeng	ngám	ngám	ngám
Ugly	....	....	maró	shopur	üchuni	khye plá	hai	hai	hai
Straight	....	....	mathunjavu	thehá	pune	ü	nan	....	trong, sü
Crooked	kom	kom	tikilang	krewi	kekurai	ke, ngok	ngok	kom, kót	ngo

	<i>Mithan</i> <i>Nágá.</i>	<i>Tablang</i> <i>Nágá.</i>	<i>Khari</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deoria</i> <i>chutia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Laos.</i>	<i>Siamese.</i>
Black	nak	niak	* nak	kati	sakokoi	dam	nam	dam, nin	dam
White	thoh	heng	mesing	kacha	puri	phók	khau, phuk	khau, pheuk	khau
Red	....	....	tamüram	mrí	saru	deng	neng	deng, kam	deng
Green	....	....	shim puluk	kapaje	pijoni	kýi	khyeu	kheau	kheau
Long	ló	lau	tilhaun	josü	lui	lej au	yau	yau	yau
Short	man	soh	tiitsizau	jü	sutugai	lot	lot	san, hun	san
Tall, (high)	chóak	tau	oregu	karkhre	sumi	sung	sung	sung	sung
Short, (low)	....	....	orejute	khau uo	patigaini	tam	tam	tam	tam bóa
Small	ahipia	sui	minghaji	kanachapo	suru suroni	noi	lek, on	lek, noi	lek noi
Great	achung, nau	yong nong	talpetiau	jopär	am chá dñi	lóng	lung, yat	luang, yai	luang, yai
Round	....	....	meketang	khruhi	tumóru	klóm, pán	món	kóm	klóm
Fat	chóng	nittan	tabiti	pomoja	mejirini	pí	pí	pí, tui	sai, man
Thin, (lean)	....	....	achi	soponoru	dugumjini	heng	yom	....	mai mau

*Conspectus of the Ornithology of India, Burma, and the Malayan peninsula, inclusive of Sindh, Asām, Ceylon, and the Nicobar islands.**

—By E. BLYTH, Esq.

Order II. RAPTORES.

Tribe DIURNÆ.†

FAM. FALCONIDÆ.‡

Subfam. FALCONINÆ.

Genus FALCO, L. (as restricted).

A. With longer caudal feathers.§

* Continued from p. 239, *ante*.

† In addition to the obvious external characters which distinguish the diurnal from the nocturnal birds of prey, and the well known differences in the skeleton, the alimentary organs exhibit certain constant differences of structure. Thus the *Diurnæ* have invariably a large crop or dilatation of the œsophagus, and two very minute *cæca coli*; while the *Nocturnæ* with a wider œsophagus have no dilatation of it whatever, and invariably two considerably developed *cæca*, resembling those of the *Meropidæ*, *Cuculidæ*, *Trogonidæ*, and *Caprimulgidæ*. These distinctions are important as being absolute, presenting no gradation from one type of structure to the other. Prof. McGillivray first brought them adequately into notice.

‡ The Eagle and Falcon family subdivides most naturally, as we conceive, into ten subfamilies, as follows.

1. FALCONINÆ. Comprising the genera *Falco*, *Hypotriorchis*, *Tinnunculus*, *Iëracidea*, *Hiërax*,* and *Harpagus* (?)
2. PERNINÆ. *Aviceda*, *Pernis*, *Cymindis*, and *Rostrhamus*.
3. ELANINÆ. *Elanus* (including *Gampsonyx*), *Nauclerus*.
4. CIRCAËTINÆ. *Circaëtus*, *Cachinna*, *Hæmatornis*, *Polyboroides*, *Serpentarius*.
5. CIRCINÆ. *Circus*.
6. ACCIPITRINÆ. *Meliërax*, *Ichnoscelis*,† *Accipiter*, *Micronisus*, *Micrastur*, *Astur*.
7. THRASAËTINÆ. *Pseudastur*,‡ *Thrasaëtus*, *Morphnus*, *Spizaëtus*.
8. AQUILINÆ. *Entolmaëtus*, *Aquila*, *Ictinaëtus*, *Hieraëtus*, *Archibuteo*, *Buteo*, *Poliornis*.
9. HALIAËTINÆ. *Pandion* (?), *Pontoaëtus*, *Blagrus*, *Haliaëtus*, *Helotarsus*, *Haliastur*, *Milvus*, *Ictinia*.
10. POLYBORINÆ. *Milvago*, *Polyborus*, *Craxirex*, *Buteogallus*, *Urubitinga*, *Ibycter*, *Daptrius*.

§ This at least is M. Schlegel's arrangement; but we do not think that his *Sacre*, *Lanner*, with the African *F. biarmicus*, and the Australian *F. subniger* and *F. hypoleucos*, and probably others, should rank immediately with the Jer Falcons.

* *Falco semitorquatus*, A. Smith, exemplifies, we conceive, another generic type of pygmy Falcons.

† *Ichnoscelis*, Strickland (1844), is rejected by Mr. G. R. Gray in favor of *Geranospiza*, Kaup (1847).

‡ Type, *Falco pæcilonotus*, Cuvier, v. *F. scotopterus*, Pr. Max. (*Pl. Col.* 9).

15. *F. CANDICANS* (?),* Gmelin (*Pl. Enl.* 446).

SYN. *F. groenlandicus*, Brehm, Hancock.

Shangar, Hind.

HAB. Northernmost regions of both continents, visiting the adjacent countries in winter.

Remark. The *Shangar* of eastern works on falconry, stated to be "very rarely met with in India, not more than one or two in a century, and then generally in the Panjab," would seem to be this species, which Dr. Schlegel accepts as distinct from *F. GYRFALCO*, and regards as a permanent variety of it, the *F. ISLANDICUS* of Brehm and Hancock.

16. *F. SACER*, Schlegel (Gould's *B. E.* pl. 20; Hardw. *Ill. Ind. Zool.*)

SYN. *F. lanarius* apud Temminck and Gould.

F. cherrug, Gray.

Cherrag, H.

HAB. Himalaya, very rare; Tahtary; E. Europe.

Remark. I think there can be little if any doubt that this Himalayan (or rather, it would seem, chiefly Tahtarian,) species is the *Sacre Falcon*, as determined by Dr. Schlegel.†

17. *F. LANARIUS* (?), Schlegel, nec Lin., nec Temminck (Hardw. *Ill. Ind. Zool.*, adult; Jerdon's *Ill. Ind. Orn.* pl. 44, young).

SYN. *F. abietinus*, (?), Bechstein.

F. juggur, Gray.

F. luggur, Jerdon.

Juggur Falcon, and probably also *Justin Falcon*, Latham.

Jhaggur, male, *Laggur*, female, Hind; *Laggádú*, Telegu (Jerdon).‡

HAB. India generally, common; and, if the true Lanner Falcon as determined by Dr. Schlegel, also S. E. Europe, and probably therefore the intervening countries.

* The Italic capitals indicate that the author has examined no Indian example of the species so distinguished.

† Buffon's figure of *le Sacre* (*Hist. des Oiseaux*, pl. 14,) might pass for that of a young *Laggur*, only that the latter has no spots on the outer webs of its tail-feathers, and there is a distinct though small moustache. It probably represents a young *Cherrag*. *N. B.* The legs of a young *Laggur* are leaden-blue, those of the adult yellow.

‡ The name *Lanner* may possibly be a corruption of *Laggur*.

Remark. This species is very closely affined to the African *F. BIARMICUS*, Tem., to which Mr. Strickland (*in epistolâ*) refers as synonymes *F. peregrinoides*, Tem., *F. chiqueroides*, Smith, *F. Feldegyi* et *F. lanarius*, Schlegel, *F. rubeus*, Thienemann, and *F. cervicalis*, Kaup. "The only difference I can find," he adds, "between *F. juggur* and *F. biarmicus*, is that the former has the tibial plumes uniform dark brown at all ages, while *F. biarmicus* has them cream-coloured or white, like the rest of the under-parts, with a small brown spot on the centre of each feather." The name *F. biarmicus* occurs in Mr. Vigne's list of birds procured in Kashmir and Little Tibet, *P. Z. S.* 1841, p. 6; and the name *F. peregrinoides* in Mr. G. R. Gray's Catalogue of the birds presented by Mr. Hodgson to the British Museum: but the specimen referred to in the latter instance is not indicated by that name in the same gentleman's second and improved catalogue of the whole collection of *Raptores* in the British Museum. Dr. Schlegel remarks that his *F. lanarius* is closely affined to *F. biarmicus*, "mais elle s'en distingue constamment par les teintes. Il paraît aussi que la première rémige est, proportions gardées, un peu plus longue dans le Lanier que dans l'espèce du Cap."

B. With shorter caudal feathers.

18. *F. PEREGRINUS*, L. (*Pl. Enl.* 421, 430, 469, 470).

SYN. *F. barbarus*, L.

F. gyrfalco, L., *Faun Suec.*, p. 23, No. 64. } apud Schlc-
F. lanarius, Pennant, *Brit. Zool.* 1, 221. } gcl.

F. communis, Brisson.

F. hornoticus et *F. ater*, Gmelin.

F. lunulatus, Daudin.

F. cornicum, Brehm.

F. calidus, Latham (India).

F. puniceus, Lev. (S. Africa), apud G. R. Gray.

F. anatum, Bonap. (N. America).

Bauri, female, *Bauri Batcha*, male. H.; *Raja Wali*, Malay (perhaps the next species); *Sikap Lang*, Sumatra (ditto); *Laki Angin* of the Passummahs (Ditto, Raffles).

HAB. Warm, temperate, and moderately cold climates of both hemispheres; though a plurality of affined races certainly exist: those

of S. Africa are constantly smaller. Common in India, many adults remaining in Lower Bengal during the cold season, and especially frequenting the vicinity of lakes and marshes, to prey on the water-fowl which resort to them; hence they are tolerably numerous in the Bengal *Sundarbans*.

Remark. "India, Europe, and N. America on the one hand, and Cape Horn, the Cape of Good Hope, and Australia on the other," writes Mr. Gould, "are all inhabited by Falcons so nearly allied to each other as to favor the opinion that they are merely varieties of each other; but I agree," he adds, "with the Prince of Canino and Professor Kaup in considering them to be distinct, and representatives of each other, in the respective countries they inhabit." *Introduction to the Birds of Australia*.

We consider the Australian species—*F. MELANOGENYS*, Kaup, (*v. macropus*, Swainson,) to be decidedly distinct from *F. peregrinus*; but strongly suspect that Mr. Gould here refers to the *Sháhin* as the Peregrine Falcon of India. The latter is undoubtedly distinct from *F. peregrinus*; but whether so from *F. melanogenys* is doubtful. Dr. Schlegel would appear to consider these to be the same. Of his *F. communis* (*peregrinus*), he writes—"Il paraît que cette espèce est répartie dans presque toutes les parties du globe, mais qu'elle forme, suivant les contrées qu'elle habite, des races plus ou moins disparates. Les Faucons Communs, par exemple, que produit l'Afrique méridionale, quoique tout-à-fait semblables au nôtre par leur organisation et leurs teintes, sont constamment d'une taille moins forte, la femelle du Faucon Commun du Cap ne surpassant pas en grosseur le mâle de notre Faucon d'Europe. Quant au Faucon Commun de l'Amerique du Nord (voir Wilson, pl. 76, et Audubon, pl. 16), Ch. Bonaparte (List, p. 4,) le sépare du nôtre sous le nom de *Falco anatum*, toutefois sans motiver son opinion. Il paraît en effet que ce Faucon d'Amerique s'éloigne du nôtre par de légères différences dans la distribution des teintes, en ce que ces teintes sont dans le premier, sur les parties supérieures, d'un brun foncé, sur le dessous d'un brun ferrugineux pâle, et que le noir de la tache en moustache s'étend ordinairement sur toute la région des oreilles. Mais il existe également dans l'Amerique du Nord des Faucons que ressemblent parfaitement au nôtre par leurs teintes; j'ai vu un pareil individu dans les galeries du Musée de Berlin. Les Faucons Communs qui viennent du grand Archipel des Indes" (*F.*

peregrinator?) “et de la Nouvelle Hollande paraissent se rapporter à ceux de l’Amérique du Nord, et n’en différer que par la teinte noirâtre, souvent uniforme des parties supérieures; cette variété a été décrite et figurée par Gould sous le nom de *Falco melanogenys*, dans son ouvrage sur les oiseaux de l’Australie. Nous en possédons six individus dont deux femelles seulement offrent une distribution semblable à celle que nous venons d’indiquer; les quatre autres, tant mâles que femelles, ressemblent parfaitement au Faucon Commun d’Europe. Il me semble, d’après ce que je viens de dire qu’en érigeant au rang d’espèces les variétés dont nous venons de parler, il convient également de separer de notre Faucon la variété à joues noires, qui se trouve en Europe.”

So far as we are aware, the Indian *Bauri* differs in no respect whatever from the Peregrine Falcon of Europe, and has never (so far as we have seen) the wholly black cheeks: but the *Sháhin* has the latter generally and tending so always, and in other respects approximates *F. melanogenys* of Australia; we suspect, however, that it never attains the size of some females of that bird (and also of *F. peregrinus*), and that the colour of its abdominal region is much deeper, while the markings of the entire under-parts of the Australian species (so far as we have seen, and as represented in Gould’s figures,) are more strongly brought out and much broader than in either *F. peregrinus* or *F. peregrinator*. Moreover as the two latter unquestionably distinct (however closely affined) species inhabit India, so there may be a plurality of equally affined species in other countries, very probably affording the solution of the difficulties suggested by Dr. Schlegel.*

19. *F. PEREGRINATOR*, Sundevall (Jerdon’s *Ill. Ind. Orn.* pl. 12, 28).

SYN. *F. shaheen*, Jerdon.

F. sultaneus, Hodgson.

F. ruber indicus, Aldrovandi.

F. melanogenys (?), Kaup.

F. macropus (?), Swainson. } Australia.

* The ordinary haunts of *F. peregrinus* and *F. peregrinator* differ. Thus, Mr. Jerdon (a most experienced observer) remarks—“Whilst the Bhyree (*F. peregrinus*) prefers the sea-coast and the neighbourhood of lakes, rivers, and wet cultivation, and the Shaheen (*F. peregrinator*) delights in hilly and wooded regions, the Juggur, on the contrary, frequents open dry plains, and the vicinity of cultivation.” *Ill. Ind. Orn.*

Sháhin ('Royal'), female; *Koëlá* ('charcoal'), male;
H.; *Jawolum*, Telegu; *Wállúr*, Tamul (Jerdon).

HAB. India generally; chiefly the hilly parts: much more rare in Lower Bengal than *F. peregrinus*; Afghanistan; Malay countries? Australia?

Remark. We have doubtfully cited the names applied to the Australian type, which we are far from satisfied is distinct; although our impression nevertheless is that the latter differs constantly from the Indian *Sháhin* as already indicated.

C. Of feebler conformation.

20. F. CHICQUERA, Shaw (Lev. *Ois. d'Afr.*, t. 30, Gould's 'Century,' pl. 2.)

SYN. *F. ruficollis* et *F. macrodactylus*, Swainson.

F. cirrhatus, var., and *Fasciated Falcon*, Latham.

Tarmatti, (*Turumtee*, Jerdon; *Toomtra*, Burnes.)
female; *Chetwá*, or *Chetoya*, male; H.

HAB. Asia and Africa; common in India.

Remark. This species is ranged in *Hypotriorchis* by Mr. G. R. Gray. We much prefer to retain it in restricted *Falco*.

Genus HYPOTRIORCHIS, Boie.

21. H. SEVERUS (*Pl. Col.* 128).

SYN. *Falco severus*, Horsfield.

F. Aldrovandi, Reinwardt.

F. guttatus, G. R. Gray.

F. rufipedoides, Hodgson.

Jhuter (quære *Jútá*, 'there goes' or *rushes*), H.;

Allap Allap Gingeng, Jav. (Horsfield).

HAB. Himalaya, Java, Philippines: visiting the plains of Lower Bengal in the cold season, where somewhat rare.

22. F. SUBBUTEO (Gould's *B. E.* pl. 22.)

SYN. *Falco subbuteo*, L.

F. barletta, Daudin.

F. pinetarius, Shaw.

F. hirundinum, Brchm.

Karjanna, H. (Hodgson); *Surkhpushtak* ('rufous-vent') of Kabul (Burnes).

HAB. Europe, Asia, and Africa : visits Lower Bengal in the cold season, where far from common. We have seen it from China.

Remark. This and the preceding species are chiefly seen about and after sunset, and doubtless also therefore about sunrise. A crepuscular tendency which has already been noticed of the Hobby by Capt. Drummond.*

Genus TINNUNCULUS, Vieillot.

23. T. ALAUDARIUS (Gould's *B. E.* pl. 26).

SYN. *Falco alaudarius*, Brisson.

F. tinnunculus, L.

F. fasciatus, Retzius.

F. brunneus, Bechstein.

F. rufescens, Swainson.

F. interstinctus, McClelland.

Cerchneis murum, *C. media*, et *C. tinnuncula*, Brehm.

Germatiá, *Gerimatiá*, *Kharumatiá*,† *Kurroutia*, *Karontia*, and *Narzi-narzának* ('tête á tête?'), H. ; *Nardunak*, Sindh (Burnes); *Gyo-thin*, Arakan (Phayre); *Allap Allap Sapi*, Jav. (Horsfield); *Raja Alia* (often used as generic for all Hawks), Ceylon (Layard).

HAB. Europe, Asia, and N. Africa : very common in Lower Bengal, where frequently seen in parties of 20 or 30 individuals, beating over the cultivated lands.

Remark. We have seen no Indian Kestrels, that were distinguishable in any way from European specimens in corresponding plumage ; but a presumed female from Ye (Tenasserim) is remarkable for the very great breadth of the black markings of its plumage, and may perhaps therefore and probably appertain to a distinct race.

24. T. CENCHRIS (Gould's *B. E.* pl. 27.)

SYN. *Falco cenchris*, Naumann.

F. tinnunculoides et *F. xanthonyx*, Natterer.

* Vide *Ann. Mag. N. H.* 1843, p. 423.

† These names, applied by Buchanan Hamilton to the common Kestrel, properly belong (we suspect) rather to No. 20, and are obviously the same as *Tarmatti* there cited. The term *Gerumatia*, however, evidently derives from *Gerumati*, orange or ochreous-yellow earth, and is therefore applicable to either.

F. tinnuncularius, Vieillot.

F. Naumannii, Fischer.

F. gracilis, Lesson.

HAB. The warmer parts of Europe and Asia; also N. Africa. In India, found chiefly on the sub-Himalayas, Nilgiris, and other high land; though far from uncommon in Lower Bengal (perhaps in the rainy season only).*

25. *T. VESPERTINUS* (*Pl. Enl.* 431; Gould's *B. E.* pl. 27.)

SYN. *Falco vespertinus*, L.

F. rufipes, Beseke.

F. subbuteo, var., Latham.

HAB. Europe, Asia, and N. Africa. In India, as the preceding species, to which it is closely affined in all but colour. Both appear to be wholly insectivorous.

Genus *HIERAX*, Vigors.

26. *H. MELANOLEUCOS*, Blyth, *J. A. S.* XII, 179 (bis).

HAB. Asám.

Remark. We have seen only one specimen of this strongly marked species, which Mr. McClelland received alive from the province named.

27. *H. EUTOLMOS*, Hodgson.

SYN. *H. bengalensis* apud Blyth, *J. A. S.* XII, 179 (bis).

Bengal Falcon, var. A, Latham.

Doung-oo-nhouk, Arakan.

HAB. Nepal, Sylhet, Arakan, Tenasserim provinces.

Remark. Edwards's figure of "the little black and orange Indian Hawk," pl. 108, upon which are founded *Falco cærulescens*, L., and *F. bengalensis*, Brisson, has never been verified by the discovery of a specimen, nor is a *Hierax* known to occur in Bengal; but we nevertheless are of opinion that a peculiar and distinct species is represented by the figure referred to, which may yet be recovered, and the more probably as several species of this genus are now known, and we are acquainted with but a single specimen of *H. melanoleucos*.

* This and the next species we have never observed wild, but certain *shikáris* take many alive with bird-lime, and we have had several newly caught specimens (procured in the immediate vicinity of Calcutta) brought in the course of a few days. They very soon become tame in captivity. The habits of both are doubtless as described in *Ann. Mag. N. H.* 1843, pp. 413, 424.

28. H. FRINGILLARIUS (*Dict. Class. d'Hist. Nat.*, pl. 21 ; *Pl. Col.* 97).

SYN. *Falco fringillarius*, Drapiez.

Hiërax malayensis, Strickland.

Malayan *F. cærulescens*, auctorum.

See-ap Belang, Penang ; *Allap*, or *Allap Allap*, Java (Horsfield).

HAB. Tenasserim provinces, Malayan peninsula, and western Indonesia generally ; replaced by other species in the more eastern islands.

Subfam. PERNINÆ.

Genus BAZA, Hodgson.

29. B. LOPHOTES (*Pl. Col.* 10).

SYN. *Falco lophotes*, Temminck.

F. ct Lepidogenys Lathamii, Gray.

Baza syama, Hodgson.

Lophotes indicus, Lesson.

Syáma ('black'), Nepal (Hodgson).

HAB. India generally ; rarer to the south : Ceylon. Not uncommon in the rainy season in Lower Bengal.

30. B. REINWARDTII (Muller, *Aves*, t. 5.)

SYN. *Falco (Lophotes) Reinwardtii*, Muller.

Lophastur Jerdoni, Blyth.

Aviceda sumatrensis, Lafresnaye, *Rev. Zool. par la Soc. Cuv.* 1848, p. 210.

HAB. Malayan peninsula, rare ; Sumatra ; Borneo ; Celebes.

Genus PERNIS, Cuvier.

31. P. CRISTATA, Cuvier (*Pl. Col.* 44 ; Muller, pl. 7).

SYN. *Falco ptilorhynchus*, Temminck.

Buteo cristatus, Vieillot.

P. Elliotti, Jameson.

P. maculosa, *P. torquata*, *P. ruficollis*, et *P. atrogularis*, Lesson.

P. apivora of India, auctorum.

Mádhava (from *madhu*, 'honey'), Nepal (Hodgson) ;

Shahatelú (from *shahad*, 'honey'), H. (Jerdon).

HAB. India generally; Malay countries: not rare in Lower Bengal.

Remark. This averages a rather larger size than the European Pern, with the beak proportionally somewhat larger; but in other respects there is a great similitude in all the many varieties of plumage, except that the Indian bird has an occipital crest more or less developed, sometimes to a length of above $2\frac{1}{4}$ in., though in many this is short or even scarcely traceable.

Subfam. ELANINÆ.

Genus ELANUS, Savigny.

32. E. MELANOPTERUS (Lev., *Ois. d'Afr.*, t. 36; Gould's *B. E.*, pl. 31.)

SYN. *Falco melanopterus*, Daudin.

F. Sonniniensis et *F. vociferus*, Latham.

F. clamorus, Shaw.

E. cæsius, Savigny.

Petite Buse Criarde, Sonnerat.

Kotta Falcon, and (the young) *Indian Falcon*, Latham.

Kápáshi ('cottony'), H.; *Angkal Angkal*, Java (Horsfield).

HAB. S. Asia and its archipelago; S. Europe (rare); and all Africa: common in Lower Bengal, and generally over India.

Remark. Of this genus, one strongly marked species exists in New Holland, in the *E. scriptus* figured in Gould's 'Birds of Australia.' Another of great beauty and even more strikingly distinct, in S. America, the *E. Swainsonii* (v. *Gampsonyx Swainsonii*, Vigors, et *E. torquatus*, Lesson). The other *Elani* of Asia, Africa, and America, are scarcely, even if at all, distinguishable. The diagnosis of the Prince of Canino separating the ordinary Elan of the New World from that of the Old (at least of Java), we have not found to hold good, and the same is remarked by Prof. Schlegel; but he distinguishes the African on the one hand, from the Asiatic and ordinary Australian on the other, referring that sometimes observed in the south of Europe to the former. This naturalist remarks, that "les traits distinctifs des diverses espèces de ce genre n'ont été indiqués jusqu'à présent que d'une manière assez superficielle. L'*Elanion* *blac*, qui visite acci-

dentalement l'Europe, quoique sa véritable patrie soit l'Afrique, se distingue constamment de l'*Elanion axillaire*, par sa queue beaucoup plus courte, et par la teinte blanche de la partie interne des ailles; du reste ces deux espèces se ressemblent assez, par rapport au système de coloration.

“L' *Elanus axillaris*, Gould, *B. Austr.*,” Vol. I. pl. 23,—“*Falco axillaris*, Lath.,—*Circus axillaris*, Vieillot, *Encycl. Method.* III, p. 1212,—*Elanus notatus*, Gould, *P. Z. S.* 1837, p. 99, 141, qui habite l' Archipel des Indes et la Nouvelle Hollande, s'éloigne du précédent par sa queue plus longue ainsi que par les grandes couvertures internes des ailles qui sont *le plus souvent** d'une teinte noire. Je ne vois pas en quoi se distingue de cette espèce des Indes, celle qui habite l'Amerique, et qui a été indiquée sous les noms suivans : *Falco dispar*, Tem., p. c. 319 (jeune de l'année), Ch. Bonap.,—*Contin. of Wilson*, pl. XI, f. 1; Audubon, pl. 352; *Elanus leucurus*, Bonap., *list*, p. 4.”

The Indian Elan has never the black patch on the under surface of the wing represented in Gould's figure of the Australian species, nor is it ever without a distinct trace of this black, in general just indicating the periphery of the marking in the Australian bird. A specimen in immature plumage from the Cape *exactly resembles* the Indian bird of the same age, in proportions as well as colouring.

Subfam. CIRCAËTINÆ.

Genus CIRCAËTUS, Vieillot.

33. C. GALLICUS (*Pl. Enl.* 413; Gould's *B. E.* pl. 13.)

SYN. *Falco gallicus*, Gmelin.

F. brachydactylus, Temminck.

F. leucopsis, Bechstein.

F. longipes, Wilson.

Accipiter hypoleucos, Pallas.

Aquila leucamphomma, Borkh.

A. pygargus, Brisson.

C. leucopsis et *C. augium*, Brehm.

Sámp-márido ('Snake-killer'), Beng.; *Sámp-mar* (ditto), H.; *Mulpatu*, Can. (Jerdon).

* The Italics are ours. E. B.

HAB. Europe, Asia, and Africa. Common on the plains of India, preferring an open country and preying chiefly on snakes.

Genus HÆMATORNIS, Vigors.

34. H. CHEELA (Gould's 'Century,' pl. 1.)

SYN. *Falco cheela*, Latham.

H. undulatus, Vigors.

Circæetus nipalensis, Hodgson.

H. et Buteo bacha, apud Franklin et Sykes.

F. albidus, Cuv., et *Buteo melanotis*, Jerdon (the young).

F. bacha, Daudin (African race).

F. bido, Horsfield (Malayan race).

Tilâi-bâj ('spotted Hawk'), B.; *Sabchur* ('full-crested'), ditto, young; *Goomcan Mooryala*, Mahr. (Jerdon); *Doung-tswon*, Arakan (Phayre); *Bido*, Jav. (Horsfield).

HAB. India generally: very common in Lower Bengal; preferring a jungly country, interspersed with tanks and shallow lakes, where it preys much on frogs, which it clutches in the mud. Hence its feet are generally clotted with mud.

Remark. Specimens of this bird from the Malay countries, and also two that we have seen from Ceylon, are rather smaller than those of India and Burma; but we can perceive no other difference. We believe Levaillant is the only author who indicates it from Africa. The Philippine race (*H. spilopterus*, Vigors), is described to be more speckled.

Subfam. CIRCINÆ.

Genus CIRCUS, Lacépède.

35. C. ÆRUGINOSUS (Gould's *B. E.* pl. 32).

SYN. *Falco æruginosus*, L.

F. rufus, Gmelin.

F. arundinaceus, Bechstein.

Accipiter circus, Pallas.

Circus palustris, Brisson.

C. variegatus, Sykes.

C. rufus, var. *indicus*,—et *C. Sykesi*, Lesson.

Konta Falcon, Muskooroo Falcon, and Rufous-eared Falcon, Latham.

Chóá or *Mát Chil* ('Meadow kite'), Beng. (generic) : *Kutar*, and *Kulehsir* ('capped'), Hind. : *Sufed Sira* ('white-headed'), and *Tiki Bauri* (Hawk with the *tika* frontal mark), *ibid.* (B. Ham.)

HAB. Europe, Asia, and Africa : common in India.

Remark. The adult males of this bird in India have yellow irides, and the wings and tail ash-grey. This phase we have never seen in Europe ; though represented (from an Indian specimen however) in Gould's 'Birds of Europe.'

36. *CIRCUS CYANEUS* (Gould's *B. E.* pl. 33.)

SYN. *F. cyaneus*, *F. pygargus*, et *F. hudsonius*, L.

F. bohemicus, *F. albicans*, *F. griseus*, *F. montanus*, *F. uliginosus*, *F. albidus*, *F. variegatus*, et *F. Buffonii*, Gmelin.

F. cinereus, et *F. rubiginosus*, *It. Poseg.* p. 29.

F. europygistus, Bosc, Daudin.

F. strigiceps et *Circus gallinarius*, Daudin.

Pygargus dispar, Koch.

Tapús, or *Músh-khor* ('Rat-eater'), of Kabul (Burnes).

HAB. Europe, N. Africa, N. and Middle Asia ; sub-Himalayan territories.

Remark. The American race, *C. uliginosus*, (Gmelin), according to Dr. Schlegel, "se distingue, dans tous les âges, du Busard St. Martin" (*C. cyaneus*) "d'Europe, par des tarses plus élevés. Le vieux mâle a ordinairement toutes les parties inférieures, à partir de la poitrine, ornées des taches nombreuses, soit orbiculaires, soit transversales, d'un brun ferrugineux." Sir W. Jardine, however, could not distinguish some Bermuda specimens from *C. cyaneus* of Europe. Vide *Contrib. Orn.* Neither does Mr. G. R. Gray regard the N. American Harrier as distinct from *C. cyaneus* in his last British Museum Catalogue of *Raptores* (1848).

37. *C. SWAINSONII*, A. Smith. (Gould's *B. E.* pl. 34).

SYN. *C. pallidus*, Sykes.

C. dalmaticus, Ruppell.

C. albescens, Lesson.

Falco æquipar, Cuvier, *M.S.*

Falco cyaneus, var. A., Lesson.

F. herbæcola (?), Tickell.

Dast-Mal ('Hand-soiler'), H.; *Tiä* (from the voice),
Derajat (Burnes); *Pandouri* (Buch. Ham.)

HAB. S. E. Europe, Asia, and Africa: common in India.

Remark. This species is regarded by Dr. Schlegel as merely a local variety of the next; but the two are about equally common in most parts of India in the same localities, and a practised eye distinguishes them readily in any state of plumage. In Lower Bengal, we have found *C. cinerascens* to be the more abundant.

38. *C. CINERASCENS* (Gould's *B. E.* pl. 35).

SYN. *Falco cinerascens* et *cineraceus*, Montagu.

C. Montagui, Vieillot.

HAB. Europe, Asia, and Africa; all India; Ceylon. Common.

39. *C. MELANOLEUCOS* (Pennant's *Indian Zoology*, pl. 2.)

SYN. *Falco melanoleucos*, Pennant.

Pahatäi, H.; *Ablak Petaha* ('Pied Harrier'), *Petaha*,
&c. (probably from the voice), Hind.; *Thin-kya*, Arakan
(Phayre).

HAB. India generally, Ceylon, Arakan, Tenasserim provinces.

Remark. The sexes of this bird are alike, and we have never seen the young, or examples in any state of plumage but the fully adult; although this species is common in Lower Bengal.

Subfam. ACCIPITRINÆ.

Genus ACCIPITER, Ray.

40. *A. NISUS*, Pallas (*Pl. Enl.* 467, 412; Gould's *B. E.* pl. 18).

SYN. *Falco nisus*, L.

F. lacteus, Gmelin.

F. nisosimilis, Tickell, *J. A. S.* II, 571.

A. fringillarius, Ray.

A. Dussumieri apud Jerdon, *Madr. Journ.* X, 84.

Nisus communis, Cuvier.

N. elegans, *N. fringillarum*, et *N. peregrinus*, Brehm.

Bassun Falcon, Latham.

Báshá,* female; *Báshin*, male; H.

HAB. Europe, Asia, and N. Africa: in India numerous in the hilly parts, rare and accidental on the alluvium of Lower Bengal. *N. B.* We have not seen this species from the eastern side of the Bay of Bengal. It is, however, an inhabitant of Japan.

Remark. The common Sparrow-hawk of N. America, *Acc. fuscus*, (Gm.), v. *F. velox* et *pennsylvanicus*, Wilson, according to Dr. Schlegel, appears to differ only from that of Europe in being rather less robust, and in the markings on the under-parts of the young assuming the form of tears; and the corresponding species of S. Africa (extending to the N. E. of that continent), *Acc. rufiventris*, A. Smith, v. *F. exilis*, Tem., p. c. 496, et *F. perspicillaris*, Ruppell, according to the same naturalist, seems to differ only from that of Europe in the lower parts of the adult being of a reddish-ferruginous, with the markings a little deeper-coloured and somewhat indistinct.

41. *A. NISOIDES*, Blyth, *J. A. S.* XVI. 727.

SYN.? Sumatran *Acc. fringillarius* of the Appendix to Lady Raffles's Memoir of Sir Stamford Raffles, p. 549.

Shikap Ballam (?), Sum. (Raffles).

HAB. Malayan peninsula; Sumatra?

Remark. Mr. G. R. Gray is mistaken in referring this as a synonyme of *Acc. virgatus*, if the latter be truly the Indian *Bázra*, as he arranges it. We rather suspect that the present species is the true *virgatus* of the Malay countries.

42. *A. VIRGATUS*? (Tem. *Pl. Col.* 109, male; Jerdon's *Ill. Ind. Zool.* pl. 4, 29).

SYN. *Falco virgatus*, Temminck, apud G. R. Gray.

A. besra, Jerdon; and the female,

A. fringillarius apud Jerdon, *Catal.*

A. Dussumieri apud Sykes.

Nisus (nec *Sparvius*) *minutus* (?) Lesson.†

* The name *Basha* is however masculine.

† Referred by Dr. Pucheran to "*Nisus soloënsis*" in the *Rev. Zool. par la Soc. Cuv.* 1850, p. 210; a species assigned by him to Sumatra on the authority of Duvaucel, and to the Coromandel Coast and Ceylon on that of Leschenault, which

F. minutus (?), L.

F. Brissonianus (?), Shaw.

Bázra (diminutive of *Báz*, 'Goshawk'), and the male,
Dharti (a 'handful,' or held in the hand), H.;
Vaishtapa Dyaga, Telugu (Jerdon); *U'r chilli*,
Tamul, Halapyk caste (Jerdon).

HAB. India generally, but chiefly the hilly parts; also the Malay countries: rare and accidental in Lower Bengal.

Genus MICRONISUS, G. R. Gray.

43. *M. BADIUS* (Tem. *Pl. Col.* 308, 336).

SYN. *Falco badius*, Gmelin.

F. Brownii, Shaw.

F. Dussumieri, Tem. (nec apud Sykes's or Jerdon's Catalogues).

Accipiter dukhunensis, Sykes.

Nisus malayensis, Meyer.

Calcutta Sparrow-hawk and *Chippuck Falcon*, Latham.

Shikrá (from *Shikárkardan*, to pursue game), female;

Chippak (or *Chipká*, Jerdon, from the voice), male,

H.; *Thin-kyet*, Arakan (Phayre).

HAB. India generally, Burmese and Malay countries; being very numerous throughout India and in Ceylon: not uncommon in Afghanistan.

Genus ASTUR, Bechstein.

44. *A. PALUMBARIUS* (*Pl. Enl.* 418, 423, 461; Gould's *B. E.* pl. 17).

SYN. *Falco palumbarius* et *F. gentilis*, L.

F. gallinarius, Gmelin.

F. albescens, Boddaërt.

Accipiter astur, Pallas.

Astur gallinarum, Brehm.

Báz or *Báz-Kháni*, female; *Júrrá*, male; H. (*N. B.*

The *Karangosh* is probably a variety.)

HAB. Europe and Asia, rare in N. Africa: in India confined, or nearly so, to the Sub-Himalayas.

leads us to suspect that our No. 42 is intended. As Mr. G. R. Gray classes *F. soloënsis*, Horsf. (v. *F. cuculoides*, Tem.), in *Micronisus*, it cannot well be our No. 41, as formerly suspected.

Remark. The N. American Goshawk, *A. atricapillus*, (Wilson), v. *F. regalis*, Tem. (*Pl. Col.* 495), is regarded by Audubon and lately by Mr. G. R. Gray as identical with the European; but M. M. Temminck and Schlegel consider them distinct, and Sir W. Jardine thus points out the differences observed by him. "The greatest difference," he writes, "between the two birds is in the marking of the breast and under-parts, and is so distinct as to be at once perceived. In the American species, the under-parts are of a uniform pale greyish-white, having the tip and centre of each feather black, forming a dark streak. This extends to those in the centre of the belly, after which it is hardly visible; every feather in addition is clouded with irregular bars of grey. In the European bird, the markings are in the shape of two decided transverse bars on each feather, with the shaft dark, but not exceeding its own breadth,—each, as a whole, having a very different appearance. The upper parts of the American bird are also of a blue shade, and the markings of the head and auriculars are more decided. Wilson's figure is a most correct representation." Dr. Schlegel remarks, that a third closely affined species inhabits Japan.

45. *A. TRIVIRGATUS* (*Pl. Col.* 303).

SYN. *Falco trivirgatus*, Reinwardt.

Astur indicus, Hodgson.

A. palumbarius apud Jerdon, *Catal.*

A. cristatus, G. R. Gray.

Spizaetus rufitinctus, McClelland, *P. Z. S.* 1839, p. 153.

Gar ('fort' or 'mountain') *Bázrá*, *Mánik* ('esteemed')

Bázrá, *Koteswar* ('fort-chieftain'), H.; *Churiáli* (frequenting peaks) Nepal.*

HAB. India, Burma, and Malay countries; being confined to the hilly parts.

Subfam. THRASÆTINÆ.

Genus *SPIZAËTUS*, Vieillot.

46. *SP. NIPALENSIS*.

SYN. *Nisaetus nipalensis*, crested variety, Hodgson, *J. A. S.* V, 229.

N. pulcher, *ibid.*, *J. A. S.* XII, 305.

* There is a great similitude of plumage in the species numbered 42 and 45.

Falco orientalis (?), et *F. lanceolatus* (?), Temminck and Schlegel.

HAB. Himalaya, and mountain ranges north of Sylhet: also mountains of Ceylon, and probably therefore those of S. India.

47. SP. CIRRATUS? (Horsf. *Zool. Res. in Java*, pl.).

SYN. *Falco cirratus* (?), Gmelin.

F. cristatellus, Temminck.

F. Lathamii, Tickell.

Nisaëtus pallidus, Hodgson, young.

Falco limnaëtus, Horsfield.

F. caligatus, Raffles.

F. niveus, Temminck.

Limnaëtus Horsfieldi, Vigors.

Nisaëtus nipalensis, crestless var., Hodgson, *J. A.*

S. V, 229.

Lake Falcon, *Bauj Eagle*, and probably *Jerwied Eagle*, Latham.

Sháh-báz or *báj* ('Regal Goshawk'), and *Sadal*, Hind.;

Lang Tanjbikar, Sum. (Raffles); *Wura Rawa*, Jav.

(Horsfield).

HAB. In two varieties, India geuerally, Burma, and Indonesia.

Remark. The very common race of Lower Bengal (distinguished above as a variety), occurring also in the Malay countries, and in the sub-Himalayan region, or at least its S. E. portions, has very rarely a developed occipital crest, but in general a mere indication of one, though in one specimen we have seen it 3 inches long. This race also becomes wholly of a sooty-black with age,* save on the base of the remiges underneath, and the tail underneath except towards its tip. The other race, diffused from the sub-Himalayas all over Hindustan, S. India, and Ceylon, has constantly (so far as we have seen) a well developed occipital crest, sometimes attaining to $5\frac{1}{2}$ in. long, and does not appear ever to assume the wholly black plumage, the young also differing in colour from the young of the preceding variety. Nevertheless, after extensive comparison of specimeus, we cannot venture to recognise

* Analogous to *Archibuteo lagopus* and *A. sancti Johannis*, though rarely so in the former of these two species (if different, as M. Schlegel contends); also to *Astur melanoleucos* of S. Africa.

these races as specifically distinct. We are unaware that this bird ever exhibits a lengthened crest in the Malay countries.

48. SP. ALBONIGER.

SYN. *Nisaëtus alboniger*, Blyth, *J. A. S.* XIV, 173.

HAB. Malayan peninsula (Penang, Malacca).

Remark. Mr. G. R. Gray places this as a variety of the preceding species, to which we cannot give our assent; unless indeed it be considered as a third and very strongly marked Malayan variety, found together with the Bengal variety, and representing the crested race of peninsular India. It is more probably a distinct species, though undoubtedly very closely affined to the preceding one.

49. SP. KIENERI.

SYN. *Astur Kieneri*, de Sparre.

Spizaëtus albogularis, Tickell, Blyth, *J. A. S.* XI, 456.

HAB. Himalaya; C. India.

Subfam. AQUILINÆ.

Genus EUTOLMAËTUS, Blyth.

50. EU. BONELLII (*Pl. Col.* 288; Gould's *B. E.* pl. 7; Jerdon's *Ill. Ind. Orn.*, pl. 1).

SYN. *Falco Bonellii*, Temminck.

F. ducalis, Lichtenstein.

Aquila intermedia, Bonelli.

Aq. bifasciata, Vieillot, *Enc. Method.* p. 1192 (apud G. R. Gray).

Nisaëtus grandis, Hodgson, *J. A. S.* V, 230.

N. niveus apud Jerdon, *Catal.*

Genoëse Eagle, Latham.

Moranga, or *Morangi* ('Slayer of Pea-fowl'), Hind.;

Talwa, Telugu; *Rajali*, Tamul (Jerdon).

HAB. S. of Europe and Asia; N. Africa: replaced in S. Africa by the affined *Eu. bellicosus*, (Daudin), v. *Falco armiger*, Shaw. In India and Ceylon, confined to the hilly parts, where far from rare.

Genus AQUILA, Meyer.

51. AQ. CHRYSÆTOS (*Pl. Enl.* 409, 410, Gould's *B. E.* pl. 6).

SYN. *Falco chrysaëtus*, *F. fulvus*, *F. melanætos*, et *F. canadensis*, L.

F. niger, et *F. americanus*, Gmelin.

F. melanonotus, Latham.

F. regalis, Temminck *Man. d' Orn.* (1815), p. 10 (nec *Pl.* Col. 495), apud G. R. Gray.

Aquila nobilis, Pallas.

Aq. regia, Lesson.

Aq. melanæetus, Brehm.

Dapheni, E. Himalaya (Hodgson).

HAB. Mountainous regions of the northern temperate zone, including the Himalaya.

52. AQ. MOGILNIK (Sav. *Descr. de l' Egypte, Hist. Nat.* I, t. 12; Gould's *B. E.* pl. 5).

SYN. *Falco mogilnik*, Gmelin.

F. ferox, and *Brown-backed Eagle*, Latham.

F. imperialis, Temminck.

Aquila heliaca, Savigny.

Aq. bifasciata, Gray.

Aq. nipalensis, Hodgson, *As. Res.* XVIII, pt. II, 13, pl. 1.

Aq. chrysaëtos apud Meyer, et Jerdon, *Catal.*

Juniz, or *Jumbiz*, H. ; *Frás*, Beng. ; *Won-lo*, Arakan.

HAB. Hill regions of S. E. Europe, Asia, and N. Africa.

53. AQ. NÆVIOIDES (Hardwicke, *Ill. Ind. Zool.*)

SYN. *Falco nævioides*, et *F. senegallus*, Cuvier.

F. rapax, Temminck.

F. obsoletus, Lichtenstein (nec Gmelin).

F. choka, A. Smith.

F. albicans, Ruppell.

Aq. fulvescens, *Aq. fulva*, et *Aq. punctata*, Gray.

Aq. vindhiana, Franklin.

Aq. imperialis apud Lesson, *Traité*, p. 97.

Wokháb, also *Jimach* (vide *J. A. S.* XV, 8), H.

HAB. Plains chiefly of India and Africa generally; but not found on the alluvium of Lower Bengal. This small Eagle is remarkable for its habit of preying on the true Falcons!

54. AQ. NÆVIA (Savigny, *Descr. de l' Egypte, Hist. Nat.*, Ois., t. 1, et t. 2, f. 1; Gould's *B. E.*, pl. 8).

SYN. *Falco nævius*, *F. maculatus*, et *F. undulatus*, Gmelin.

Aq. melanaëtos, Savigny.

Aq. clanga, Pallas.

Aq. bifasciata, Hornsch.

Aq. pomarina, Brehm.

Aq. planga et *Spizaëtus fuscus*, Vieillot.

Spotted Eagle, and *Brown-backed Eagle*, var. A, Latham.

Káljanga, *Bakayári*, *Jiyadha* (B. Ham.)

HAB. East of Europe, Asia, and N. Africa. Common in the Bengal Sundarbans, and found likewise in Central and S. India.

55. AQ. HASTATA.

SYN. *Morphnus hastatus*, Lesson.

Spizaëtus punctatus, Jerdon.

Limnaëtus unicolor apud Blyth, *J. A. S.* XII, 128.

Jiyadha, and *Guti-már* ('cocoon-destroyer'), H.

HAB. Common in the Bengal Sundarbans, and found likewise in Upper Bengal, and in Central and S. India.

Remark. This and the preceding three species vary greatly in plumage. No. 53 is in structure a miniature of No. 52; No. 54 is larger than No. 53, but less robust; and the present species, with about the same linear dimensions as No. 54, is again of more feeble conformation. A practised eye readily distinguishes either in any phase of colouring.

Genus ICTINAËTUS, Jerdon (nec Kaup).

56. I. MALAIËNSIS (Tem. *Pl. Col.* 117).

SYN. *Falco malaiënsis*, Reinwardt.

Aquila et *Heteropus* et *Neopus perniger*, Hodgson.

Nisaëtus? ? *ovivorus*, Jerdon.

Black Eagle, Jerdon, *Catal.*, and *Supp.*

HAB. S. E. Himalaya; Nilgiris; Malay countries.

Genus HIERAËTUS, Kaup.

57. H. PENNATUS (Tem. *Pl. Col.* 33; Gould's *B. E.* pl. 9).

SYN. *Falco pennatus*, Gmelin.

F. lagopus, Bengal variety, Latham.

Aquila minuta, Brehm.

Spizaëtus milvovides, Jerdon.

Butaquila strophinata, Hodgson (vide *Calc. Journ. N. H.* VIII, 95).

HAB. E. Europe, Asia, Africa; India generally; Ceylon.

Remark. Prof. Schlegel mentions this bird as of very rare occurrence in Europe and Africa, and that he did not know its proper habitat. It appears to be far from rare throughout India; and the Society's Museum contains a fine series of specimens from the vicinity of Calcutta.

Genus ARCHIBUTEO, Brehm.

58. A. HEMIPTILOPUS, Blyth, *J. A. S.* XV, 1.

SYN. *A. cryptogenys*, Hodgson, *Calc. Journ. Nat. Hist.* VIII, 89, and pl. 5, f. 1.

HAB. Sikim; Tibet.

Genus BUTEO, Cuvier.

59. B. AQUILINUS, Hodgson, Blyth, *J. A. S.* XIV, 176 (March, 1845).

SYN. *B. leucocephalus*, Hodgson, *P. Z. S.* 1845, p. 37 (April).

Falco asiaticus (?), Latham, *Index. Orn.* p. 14.

F. hemilasius (?), Temminck and Schlegel.

B. strophias, Hodgson, apud Kaup and G. R. Gray.

HAB. Nepal (G. R. Gray); Tibet; China? Japan?

60. B. PLUMIPES, Hodgson, *P. Z. S.* 1845, p. 37.

SYN. *Circus plumipes*, Hodgson, *Beng. Sp. Mag.* 1836, p. 182; *J. A. S.* XV, 2.

HAB. Nepal; Tibet.

61. B. RUFINUS (Ruppell, *Zool. Atlas*, t. 27).

SYN. *Circus rufinus*, Ruppell (apud G. R. Gray).

C. et Buteo pectoralis, Vieillot, var.?

B. canescens, Hodgson.

B. longipes, Jerdon.

Nasal Falcon, Latham.

Chuhá Már ('Rat-killer'), H.

HAB. India generally; plains and lower hills. In Lower Bengal, found only above the tideway of the river: also N. Africa.

62. B. VULGARIS, Bechstein (Jerdon's *Ill. Ind. Orn.* pl. 27).

SYN. *Falco buteo*, L.

F. glaucopsis, Merrem.

F. variegatus, *versicolor*, *cinereus*, et *obsoletus*, Gmelin.

F. pojana, Savi.

B. albus, Daudin.

B. mutans et fasciatus, Vieillot.

B. septentrionalis, medius, et murum, Brehm.

B. communis, Cuvier.

B. Swainsonii, Pr. Bonap.

B. montanus, Ruppell.

B. rufiventer, Jerdon.

HAB. Northern hemisphere; rare and to the northward only in America. The loftier hills only in India.

Remark. We doubt if this can in all cases be satisfactorily distinguished from the preceding species, and certainly not some European specimens from some Himalayan or Nilgiri examples.

63. *B. PYGMÆUS*, Blyth, *J. A. S.* XIV, 177.

SYN.? *Astur barbatus*, Eyton, from Malacca (referred by Mr.

G. R. Gray to the Japanese *Falco* or *Poliornis pyrrhogenys*, Temminck and Schlegel).

HAB. Tenasserim provinces; Malayan peninsula?

Remark. This is a true long-winged *Buteo*, though resembling *Poliornis* in some respects; and Mr. Eyton's description sufficiently well applies to it, allowing for some variation of plumage from the Society's specimen. The admeasurements in particular correspond.

Genus POLIORNIS, Kaup.

64. *P. TEESA* (Hardwicke's *Ill. Ind. Zool.*).

SYN. *Circus teesa*, Franklin.

Astur hyder, Sykes.

Zuggun Falcon, Latham.

P. fasciatus (?), A. Hay, *Madr. Journ.* XIII, 146.

Tisa (or *Teesa*, from the voice), H.

HAB. Plains of India, where very abundant: never met with on the mud-soil of Lower Bengal, though appearing immediately this is quitted in a westerly direction: Tenasserim provinces; Malayan peninsula?

Remark. Specimens from Tenasserim and from S. India having large whitish supercilia appear to agree with Lord A. Hay's description of his *P. fasciatus* from Malacca; and the *Astur barbatus*, Eyton, from Malacca, referred to the Japanese *P. (?) pyrrhogenys* by Mr.

G. R. Gray, we have already dubiously assigned to No. 63. The present genus, on mature consideration, we have placed next to *Buteo*, the lengthened cere separating it from the ACCIPITRINÆ among which it is included by Mr. G. R. Gray and others, following Col. Sykes. Major Franklin referred it to *Circus*, and Prof. Kaup regards it as subordinate to *Circæetus*.

Subfam. HALIAËTINÆ.

Genus PANDION, Savigny.

65. P. HALIAËTUS (Gould's *B. E.* pl. 12).

SYN. *Falco haliaëtus*, L.

F. carolinensis, *F. cayanensis*, et *F. arundinaceus*, Gmelin.

F. piscator, Brisson.

Aquila piscatrix, Vieillot.

Aq. balbazardus, Dumeril.

P. fluvialis, Savigny.

P. americanus, Vieillot.

P. alticeps et *P. planiceps*, Brehm.

P. indicus, Hodgson.

P. ichthyæetus, Kaup (apud G. R. Gray).

Bengal Osprey, Latham.

Máth-Morol ('Fish Tyrant'), and *Bulla*, B.; *Mu-cherera*, H. (Jerdon); also *Máth-mángá*, H.: *Won-let*, Arakan (Phayre).

HAB. Of general distribution; the Australian race (*P. leucocephalus*, Gould, which according to M. Schlegel is found also in Japan and in the eastern Archipelago), alone slightly differing. Common throughout India, in all suitable localities.

Remark. The Osprey is a very peculiar form among the *Falconidæ*, and wants the projecting super-orbital bone which is so characteristic of (we believe) all the rest. The next genus approximates *Pandion* in the adaptation of structure for piscivorous habits, but is nevertheless very distinct, and much more nearly affined to true *Haliæetus*.

Genus PONTOAËTUS, Kaup.

66. P. ICTHYAËTUS (Horsf., *Zool. Res. in Java*, pl.).

SYN. *Falco ichthyæetus*, Horsfield.

Haliaëtus plumbeus, Hodgson.

Ichthyæetus bicolor, G. R. Gray.

Pandion lineatus (?), Jerdon, young.

Máitch-morol ('Fish Tyrant'), Beng. ; *Madhuya*,
H. (B. Ham.) ; *Jokomaru*, Java (Horsfield).

HAB. India and Malay countries : common in Lower Bengal.

67. P. HUMILIS (Tem. and Müller, *Ois.* t. 6).

SYN. *Falco* (*Pandion*) *humilis*, Müller.

Ichthyæetus nanus, Blyth, *J. A. S.* XI, 202, et XII, 304.

HAB. Malayan peninsula ; Sumatra.

GENUS *BLAGRUS*, Blyth.

68. B. LEUCOGASTER (*Pl. Col.* 49 ; Gould's *B. Austr.* Vol. I, pl. 3).

SYN. *Falco leucogaster*, Gmelin.

F. blagrus, Daudin.

F. dimidiatus, Raffles.

F. albicilla, var., Latham.

Ichthyæetus cultrunguis, Blyth, the semi-adult.

Haliaeetus sphcnurus, Gould, the young.

Kampi-mar Eagle, the semi-adult ; and *Maritime Eagle*,
the adult ; Latham.

Tampa-már ('Snake-killer'), Orissa ; *Kohásá*, H.
(Jerdon) ; *Langlaut*, Sum. (Raffles).

HAB. India ; Africa (?) ; the Malay countries ; and Australia.
Tolerably common in Lower Bengal.

GENUS *HALIAE'TUS*, Savigny.

69. H. MACEI (Tem. *Pl. Col.* 8).

SYN. *Falco Macii*, Temminck.

H. albicilla apud Vigors and Horsfield ?

H. ossifragus (?) apud Raffles.

H. fulvigaster, Vieillot.

H. albipes, Hodgson.

H. unicolor, Gray, the young (*Hardw. Ill. Ind. Zool.*)

Máitchéráng, *Máitch-manggar*, *Korol*, or *Máitch-korol*
('Fish Eagle'), and *Bala*, Beng. ; *Kokna*, or *Oogoos*
(Tickell) ; *Lang-laut* ? (Sum.) Raffles.

HAB. Northern India generally ; abundant in Lower Bengal ;
Malay countries ?

Genus HALIASTUR, Selby.

70. H. INDUS (*Pl. Enl.* 416).SYN. *Falco indus*, Boddaërt.*F. ponticerianus*, Gmelin.*Haliaëtus girrenara*, Vieillot.*H. garruda*, Lesson.*Milvus rotundicaudatus*, Hodgson, young.

Shankar Chil ('Shiva's kite), *Dhobia Chil* ('Washer-man's Kite'), and *Ruh-mubárik* ('lucky-faced,' i. e. propitious), Hind. ; *Khemañkari*, Sanskrita ; *Rutta Ookal*, Sindh (Burnes), also *Pilyo* ; *Tswongoung phyoo*, Arakan (Phayre) ; *Lang bondal*, Sum. (Raffles) ; *Ulang*, Java (Horsfield).

HAB. India and Malay countries ; extremely common ; replaced by a nearly affined species in Australia.

Genus MILVUS, Cuvier.

71. M. GOVINDA, Sykes.

SYN. *M. cheele*, Jerdon.*M. melanotis*, Temminck.*Haliaëtus lineatus* (?), Gray, *Hard. Ill. Ind. Zool.*

Chil (from the voice), or *Pariah Chil*, H. ; *Tswon-bop*, Arakan (Phayre).

HAB. S. E. Asia and its islands ; extremely common. In Lower Bengal it disappears during the rainy season.

Remark. The dark-plumaged Kites (*Hydroictinia*, Kaup,) are widely diffused over the Old World and Australia, and among them the African, *M. ægyptius*, (*Falco ægyptius* et *F. Forskali*, Gm., and *F. parasitus*, Daudin,) is well characterized by its yellow beak and some other differences ; but we are not aware in what the Australian (*M. affinis*, Gould), and that of Europe and "temperate Asia" (Schlegel,—*M. niger*, Brisson), differ from that so abundant over all S. E. Asia. Mr. Strickland refers the Indian bird to *M. niger* (of which the synonymes cited by Mr. G. R. Gray are *F. ater*, Gmelin, *F. migrans*, Boddaert, *F. fusco-ater*, Meyer, *F. cinereo-ferrugineus*, Forster, *Accipiter milvus*, Pallas, and *M. fuscus*, Brehm.) We have provisionally followed Mr. Gray and Prof. Kaup in regarding the Indian Kite as distinct from *M. niger*, but greatly suspect that the separation will be found premature, when more extensive series of specimens from the two regions shall have been carefully compared.

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL

FOR APRIL, 1850.

The usual monthly meeting of the Asiatic Society was held at the Museum, on Wednesday, the 3rd April, at half past 8 P. M.

The Hon'ble Sir J. W. COLVILLE, President, in the chair.

The Proceedings of the former meeting having been read and confirmed, the Secretary stated that Dr. J. McClelland and Capt. Bazeley had intimated their wish to withdraw from the Society.

The following gentlemen, having been regularly proposed and seconded at the March meeting, were balloted for and elected ordinary members of the Society :—

A. J. M. Mills, Esq., B. C. S.

D. T. Morton, Esq., Madras, M. S.

Hon'ble Capt. R. B. Byng.

C. T. Watkins, Esq.

Rev. W. Kay, Bishop's College.

Read letters—

From H. V. Bailey, Esq., Offg. Under Secretary to the Government of Bengal, presenting for the use of the Museum of Economic Geology, a geological Map of the Monghyr district.

From J. Thornton, Esq., Secretary to the Government of the North Western Provinces, forwarding copy of a letter from Lieut. R. Strachey, Bengal Engineers, informing the Society and the public of the nature and extent of his late scientific researches in Kumaon. (Published in the Journal No. I. of 1850).

From F. J. Mouat, Esq., Secretary to the Sub-Committee of Machinery of the General Committee of Industry and Arts, requesting information regarding Miss Tytler's Models.

From Sir Henry Elliot, forwarding a Notice of the 4th volume of Tabary's History, by Dr. A. Sprenger. (Published in the last No. of the Journal).

From James Hume, Esq., Honorary Secretary of the Agri-Horticultural Society of India, transferring some samples of ore forwarded by Capt. J. C. Brooke, Commandant of the Mewar Bheel Corps, from a place called Jáwar, lying midway between Kherwára and Ūdypur, together with a note from Dr. Dodd, Assay Master, who states the metal obtained from the ore to be zinc.

From Capt. Newbold, enclosing a paper by Hekekeyan Bey, on the Lead mines of Kohil et Terifel in Egypt.

From Major Wylie, Officiating Secretary to the Government of India, Military Department, transmitting three sheets of the Indian Atlas, received from the Hon'ble Court of Directors.

From Capt. Thomas Hutton, respecting certain Zoological specimens stated to be his property, and which he desires to be kept in deposit for him.

From Dr. E. Roer, Secretary to the Oriental Section, recommending on the part of the Section, the gradual publication of certain Oriental works in the Bibliotheca Indica. Referred to the Section for further consideration.

From Mr. H. Piddington, apologizing for his absence on account of illness, and forwarding an examination of a new Mineral, CALDERITE.

The Librarian having submitted his report, the meeting adjourned.

Read and approved at the meeting of the 1st May, 1850.

WELBY JACKSON, *Vice-President.*

RÁJENDRALÁL MITTRA, *Assistant Secy.*

LIBRARY.

The following books have been received since the last meeting.

PRESENTED.

Tazkerat-ul-kámelín, or Biography of eminent persons. By Rámachandra. Delhi, 1849. 8vo. (Lithograph).—PRESENTED BY SIR HENRY M. ELLIOT, KT.

Masháh-ut-tálabín or an Index to the Historians of Mahomedan India. Simlah 1849. 12mo. (Lithograph).—BY THE SAME.

Miftáh-ut-tawárikh, or the Key to History, being a Collection of the most valuable Chronograms in the Persian language. Edited by J. W. Beale. Agra 1849. 4to.—BY THE SAME.

Nouvelles Recherches sur l'Apparition et la Dispersion des Bohémiens en Europe, par Paul Battailord. Paris, 1849. 8vo. (Pamphlet).—BY THE AUTHOR.

Harivaṅśa, ou Histoire de la famille de Hari, traduit sur la original Sanskrit, par M. A. Langlois. 2nd Livraison. Paris, 1836. 4to.—BY REV. J. WENGER.

Journal of the Indian Archipelago. Vol. IV. No. II.—BY THE EDITOR.

Two copies of the same.—BY THE GOVERNMENT OF BENGAL.

Upadeshaka, No. 40.—BY THE EDITOR.

The Calcutta Christian Observer, for April 1850.—BY THE EDITORS.

The Oriental Baptist, No 40.—BY THE EDITOR.

Trigonometrical Survey Maps, Nos. 69, 70, 89.—BY THE GOVT. OF INDIA.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of February 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Amherst as a Sanatorium. By E. Ryley, Esq. Calcutta, 1850, (Pamphlet).—BY THE AUTHOR.

Tattwabodhinī Patrikā, No. 75.—BY THE TATTWABODHINI' SABHA'.

EXCHANGED.

Journal of the Agricultural and Horticultural Society of India. Vol. VII. Part I.

PURCHASED.

The Edinburgh Review. No. 183.

The North British Review. No. 23.

Journal des Savants. For Nov. 1849.

Comptes Rendus. Nos. 19 @ 24.



FOR MAY, 1850.

The usual monthly meeting of the Asiatic Society was held on the 1st of May, 1850.

WELBY JACKSON, Esq., Vice-President, in the chair.

The proceedings of the last meeting were read and confirmed.

Communications were read—

From C. W. Montrou, Esq., Superintendent of the Observatory at Colaba, forwarding a copy of the Magnetical and Meteorological Observations made at that Observatory during the year 1846.

From H. V. Bailey, Esq., Officiating Under Secretary to the Government of Bengal, enclosing copy of a letter addressed to the Military Board, respecting the repairs of the Adinah Masjid.

From C. Gubbins, Esq., C. S., transmitting 12 old copper coins, found in the district of Meerut.

From the Librarian, Bábu Rájendralál Mittra, submitting the subjoined note respecting the coins presented by Mr. Gubbins.

The analogues of these coins have been figured by Mr. Thomas, in his *Patan Coins of India*, figs. 167-8, with which the present specimens agree in rudeness of execution, and in their general appearance. They belong to the period of Sekundar Shah Behlol, who succeeded to the throne of Delhi on the death of his father Behloli Lodi, in 894 A. H., A. C. 1488. The die with which they have been struck having been larger than the coins themselves, it is difficult to decypher the legend, but the comparison of several specimens leaves no doubt on the subject. The coins are of different mintage and dates, and vary in weight from 142 to 148 grains—a difference easily accountable in copper coins nearly four hundred years old. On the obverse, in Mr. Thomas's specimens, the phrase *بھلول شاہ دہلی* follows the word *سلطان*, but no trace of it can be found on the specimens under examination.

Obverse.

۹۱۷, ۹۱۶, ۹۱۵, ۹۰۳ (date) *المملوک الرحمن سکندر شاہ بھلول شاہ سلطان*
۹۱۹ (or) ۹۱۸,

Reverse.

فی زمن امیر المومنین خلدت خلافتہ

From Dr. E. Roer, Secretary to the Oriental Section, recommending on the part of the Section, that an English translation of the Ch'handogya Upanishad submitted by Bábu Rájendralál Mittra, be printed in the Bibliotheca Indica.

The Oriental Section having neglected to record their opinion on the subject, *ordered*—that it be referred to the Section for their opinion.

A copy of Dr. Hooker's *Rhododendrons of Sikkim-Himálaya* was presented by the Hon'ble the President, on behalf of the author, for which the thanks of the Society were voted.

Read a letter from Dr. O'Shaughnessy, dated the 15th of April, sending his resignation of the office of Secretary to the Society.

To the Hon'ble Sir JAMES COLVILLE.

President to the Asiatic Society.

HON'BLE SIR,—Additional duties having devolved upon me in the Mint, and a trial Electric Telegraph having been ordered—the Construction of which

I have to Superintend; it becomes impracticable for me to continue in charge of the Office of Secretary to the Asiatic Society.

I have therefore to request that you will communicate my resignation to the Council and the Society at large.

In the interval between this and the next meeting I will make every arrangement for clearing off any arrears of business and correspondence, so as to facilitate the duties of my successor, to whom it will afford me great pleasure to give every assistance in my power on his taking charge of the Office.

I have the honor to remain,

Your obedient servant,

W. B. O'SHAUGHNESSY, *V. P. and Secy. As. Soc.*

Calcutta Mint, 15th April, 1850.

It was unanimously resolved, that this meeting, while it receives with regret the resignation of Dr. O'Shaughnessy, desires to express its grateful sense of the valuable services which, as senior Secretary, he has so long rendered to the Asiatic Society of Bengal; and that the Secretary communicate the sentiments of the Society as above expressed to the late Secretary; and that it be published in the Journal.

Read a report of the Council of the Society, recommending the appointment of Capt. F. C. C. Hayes to succeed Dr. O'Shaughnessy as Secretary: the report is as follows:

At a meeting of the Council held on the 19th of April, 1850.

Present.

THE HON'BLE SIR JAMES COLVILE, *President.*

W. B. JACKSON, ESQ. *Vice-President.*

W. SETON KARR, ESQ.

S. G. T. HEATLY, ESQ.

R. W. G. FRITH, ESQ.

BÁBU RAMGOPAL GHOSE.

C. BEADON, ESQ.

} *Members.*

The President stated that since the circulation of Dr. O'Shaughnessy's letter of the 15th of April, 1850, he had ascertained that Capt. Fletcher Hayes was willing to be put in nomination for the office of Secretary. Wherefore it was resolved unanimously

That Capt. Fletcher Hayes be proposed by the Council to the next general meeting of the Society for election as Joint Secretary of the Asiatic Society of Bengal in the room of W. B. O'Shaughnessy, Esq., M. D., resigned.

The meeting unanimously approved of the nomination of the Council.

Confirmed, 3rd June, 1850, J. W. COLVILE, *President.*

FLETCHER HAYES, *Secretary.*

LIBRARY.

The following books have been received since the last meeting.

PRESENTED.

The Rhododendrons of Sikkim-Himálaya, being an account, Botanical and Geographical, of the Rhododendrons recently discovered in the mountains of Eastern Himálaya, from drawings and descriptions made on the spot, during a Government Botanical Mission to that country; by Joseph Dalton Hooker,

R. N. Edited by Sir J. W. Hooker, K. H.—PRESENTED BY THE AUTHOR, THROUGH HON'BLE SIR J. W. COLVILLE.

Notes of a tour in the Plains of India, the Himálaya, and Borneo; being extracts from private letters of Dr. J. D. Hooker. Part II. Calcutta to Darjiling. London 1849, 8vo.—BY THE SAME.

Observations made at the Magnetical and Meteorological Observatory at Bombay; in the year 1846. Printed under the superintendence of A. B. Orlebar, Esq. Bombay 1849. 4to.—BY THE GOVERNMENT OF BOMBAY.

An Historical Account of the Royal Hospital at Greenwich. London 1789. 4to.—BY BÁBU RA'JENDRALA'L MITTRA.

A short Life of the Apostle Paul, in Sanskrit verse. Calcutta 1850. 13mo. (2 copies).—BY J. MUIR, Esq., C. S.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of March 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Tattwabodhiní Patriká, No. 81.—BY THE TATTWABODHINI' SABHA'.

Journal of the Indian Archipelago for March 1850.—BY THE EDITOR.

Two copies of the same.—BY THE GOVERNMENT OF BENGAL.

The Oriental Christian Spectator, for February 1850.—BY THE EDITOR.

PURCHASED.

Journal des Savánts for December 1849.

The North British Review, No. 24.

Annals and Magazine of Nat. History for February, 1850.

Comptes Rendus. Tome XXIX. Nos. 25-7.

To the Secretary of the Asiatic Society.

SIR,—I have the honour to present the following report of donations made to the Zoological Department of the Society's Museum during the months of March and April.

1. From Dr. Kelaart, Staff Asst. Surgeon, Newera Elia. A small collection of birds' skins from that locality, comprising several undescribed species.

2. Lt. James, N. I. Selections from a collection of skins of Mammalia and Birds, made in Kunáwar, Kashmir, and Tibet.

3. Bábu Rajendra Mallika. Specimens of *Lemur niger*, Geoffroy, and *Gazella subgutturosa*, female; also carcass of a female Nilgai.

4. Mr. Moxon, of the Pilot Service. Some fine examples of *Larus ichthyæetus*, Pallas, and skeleton of this bird and of *Onichoprion anasthætus*.

5. Mr. W. Driver. Carcass of an adult female *Hylobates hoolock*.

6. Mr. G. K. Rode. Caterpillar of an *Acherontia*.

7. Mr. Muller. 3 species of Ophidia, from Darjeling.

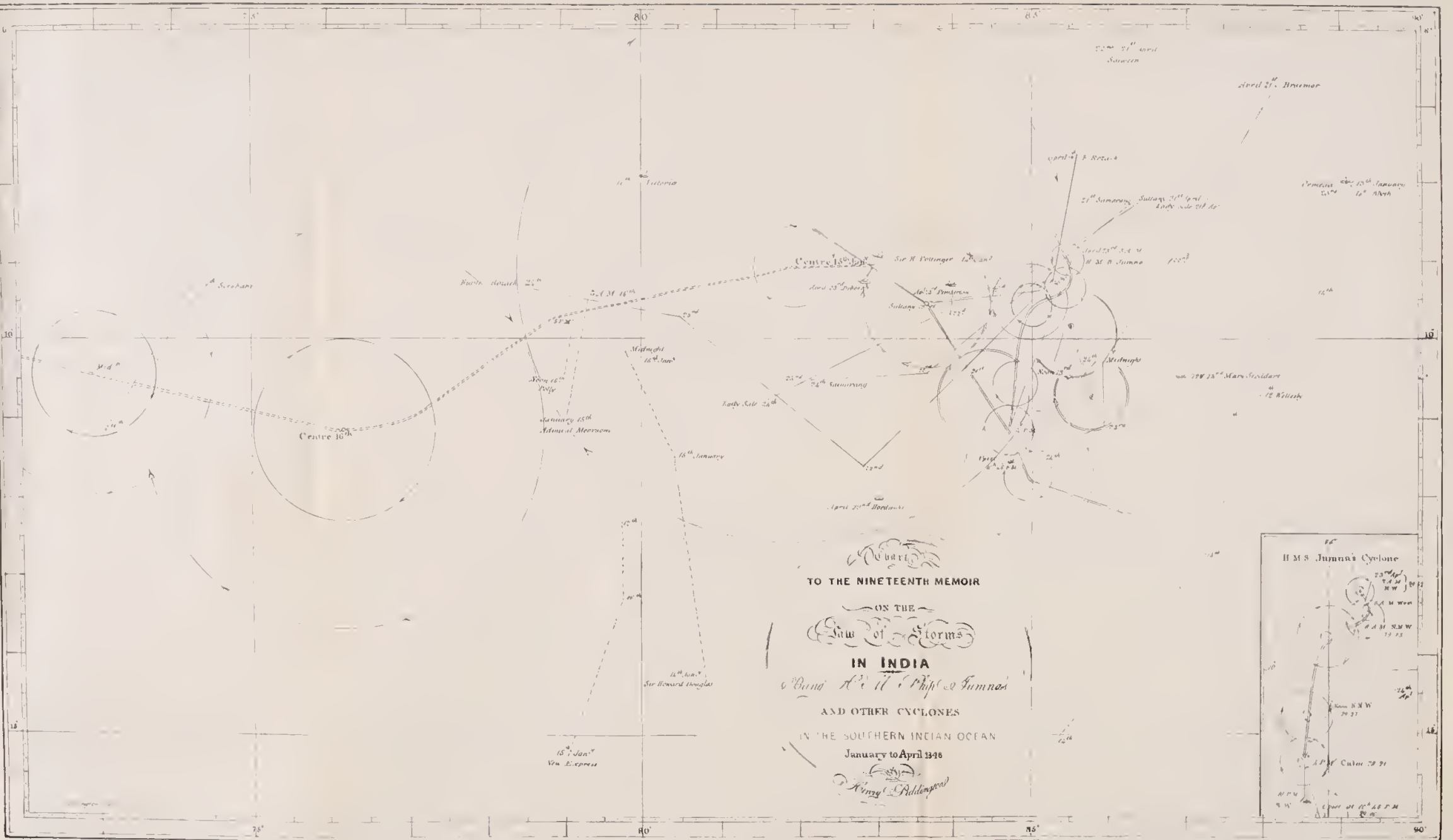
8. Capt. Sherwill. A few shells from the vicinity of Rajmahal.

9. Capt. Thos. Brodie. Skin with horns of apparently a large female of the animal described by Mr. Hodgson in No. XXXVII. (N. S.) of the Society's Journal, by the name *Budorcas taxicolor*. N. B. Various skins of this species have at various times been presented to the Society, by Major Jenkins, and Capt. E. L. Smith of Sadiya; but only one, a female, in a fit condition to be set up, which has been mounted. I had postponed describing it until I could obtain a perfect skull; and may here remark that I believe its affinities to be strictly *Caprine*, with little relation either to the Bovine group or to the Gnoos (*Catoblepas*), notwithstanding the very remarkable form of the horns.

I have the honour to be, Sir,

Your obedient servant,

E. BLYTH.



TO THE NINETEENTH MEMOIR

ON THE
Law of Storms

IN INDIA

By *Comd'r H. H. Phipps & J. J. J. J.*

AND OTHER CYCLONES

IN THE SOUTHERN INDIAN OCEAN

January to April 1846

Wm. H. Phipps

